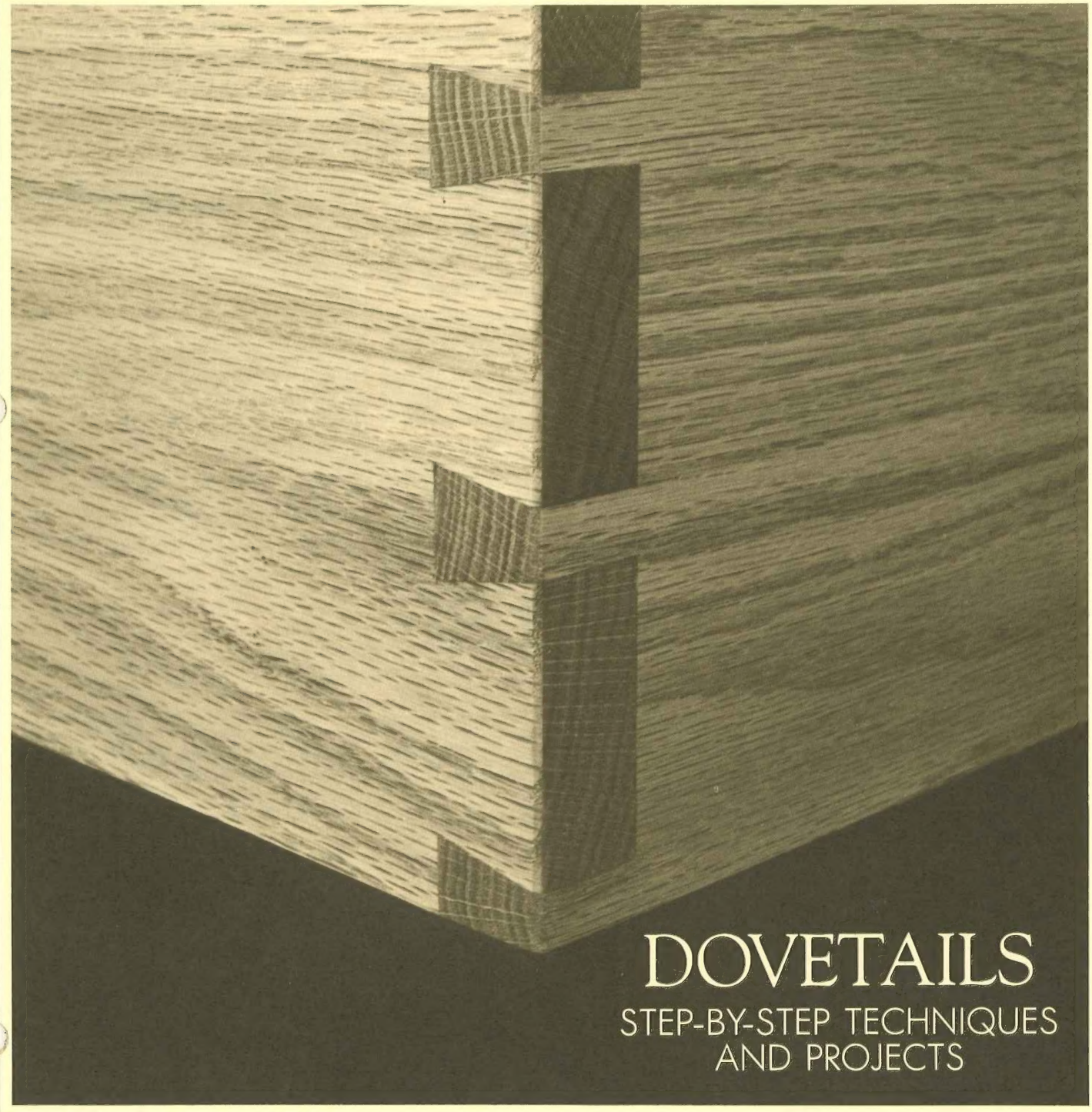
NO.19 NOTES FROM THE SHOP

Woodsmith®



DOVETAILS

STEP-BY-STEP TECHNIQUES
AND PROJECTS

Woodsmith

Number Nineteen **January, 1982**

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ABOUT THIS ISSUE. Two years ago we devoted an entire issue of *Woodsmith* to mortise and tenon joinery. At the time I was somewhat hesitant to have only one subject in an issue. But now we're at it again. This time with dovetails.

I realize that a lot of woodworkers tend to avoid this joint. I think that's because dovetail joinery also has that image of being reserved for only an elite group of master craftsmen.

I understand that feeling. But I also know the feeling of being in the shop, all alone, working quietly with hand tools, and cutting a joint that's a bit of a challenge. True, it takes concentration, but it must be relaxed concentration. Being thoroughly involved in your work, yet calm and relaxed . . . and having a bundle of fun doing it. It's rewarding work.

COFFEE TABLE. My favorite project in this issue is the Contemporary Coffee Table. It looks so simple. Just a top, two sides, and three drawers. But simple? No. In fact, it requires a certain measure of courage to undertake this project.

I wish I could take credit for designing and building it, but I can't. Ted Kralicek (our Art Director) is the one who had the patience and the guts required to cut all those dovetails.

Ted might get mad at me for what I'm about to say, but . . . before building this table, Ted made only three practice runs at cutting dovetails. The first two were complete disasters. By the third try he was getting pretty good so he decided to go for broke on this table.

The best part of this story is the tools he used. We were down at a local store that sells woodworking tools. The store manager handed us a mangled Japanese dovetail saw (half the teeth were missing). The saw had been purchased and mangled by an irate customer who proclaimed, "The darn thing doesn't work."

Ted used the saw on his third practice run, and produced a set of perfectly matched dovetails. If there's a lesson here, I guess it's that if you want to do something all you have to do is do it.

PUBLISHER'S STATEMENT Every year in the January issue we're required by the Post Office to run the statement shown below. Although I try not to think of *Woodsmith* in terms of the number of people subscribing, it's fun to see the growth.

We've almost tripled our circulation in the past year. But more important, we've doubled the number of pages in each issue. And I'd like to think that we've made some friends along the way.

NEW FACES. Part of the growth at *Woodsmith* includes a few new faces. Donna Prins has joined us to help with opening the mail and getting everyone's subscriptions entered in our computer.

Cheryl Scott has taken on the challenge of keeping the computer in line. Cheryl will also be helping out with a lot of the administrative functions She's also volunteered to correct my spelling.

INDEX OF CONTENTS I'd like to thank Chris Kozakiewicz for making possible the Index of Contents in this issue. Chris (one of our subscribers in New Jersey) took it upon herself to get this project started.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION

(Required by 39 U.S.C. 3685)

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A. Total no. copies printed (net press run)	23,116	31,527
B. Paid circulation		
1. Sales through dealers and carriers, street vendors and counter sales	396	992
2. Mail subscriptions	21,527	28,772
C. Total paid circulation (Sum of 10B1 and 10B2)	21,923	29,764
D. Free distribution by mail, carrier or other means samples, complimentary, and other free copies	21	21
E. Total distribution (Sum of C and D)	21,944	29,785
F. Copies not distributed		
1. Office use, left over, unaccounted, spoiled after printing	1,202	1,622
2. Returns from news agents	20	120
G. Total (Sum of E, F1 and 2, should equal net press run shown in A)	23,166	31,527

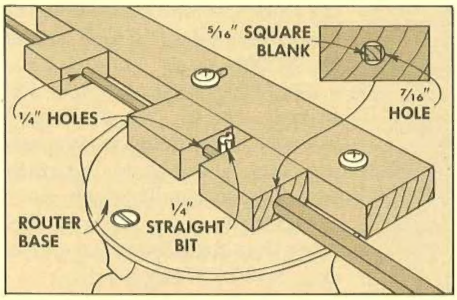
11. I certify that the statements made by me above are correct and complete: (signed) Donald B. Peschke, Publisher.

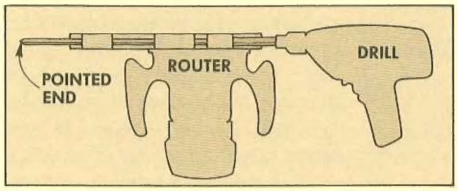
Tips & Techniques

CUSTOM MADE DOWELS

During the process of making reproductions of turn-of-the-century fretworks, I discovered I needed several ¼" white oak dowels for spindles. After trying several methods to make my own 'custom made' dowels (without much success), I finally came up with the following set-up using my router and electric drill.

As shown in the diagram, the basic set-up consists of three blocks attached to a fence, which in turn is bolted to the base of a portable router. Before gluing the blocks to the fence, I drilled a 7/16" hole in one block, and ¼" holes in the other two.





The infeed block (with the 7/16" hole) is glued 1½" from the end of the fence. The outfeed block (¼" hole) is glued ½" from the first block. These two blocks support the square blanks as they pass by the ¼" straight router bit. The third block (also with a ¼" hole) supports the end of the dowel to prevent whipping.

To attach the fence to the base of the router, I drilled one hole in the fence the exact size of a No. 10-32, 1¼" pan head bolt. The other hole was drilled twice, forming a slot to allow for fine adjustments.

To make the dowels, I cut a "blank" 5/16" square. The end of the blank is pointed to help guide it into the outfeed hole. The blank is then chucked in a portable drill and *slowly* advanced past the router bit.

I usually make the dowels a little oversized and sand them to their finish size.

Lloyd R. Dickinson
Glendale, California

At first, I was a little skeptical about Mr. Dickinson's dowel-making jig, but we decided to build it and try it out in the shop. After trying the jig, I was amazed how well it works.

We found that the tighter the dowel fits into the outfeed holes of the last two blocks, the better finish you'll get. Any sloppiness here will cause an uneven dowel (a sort of spiral effect). The size of the finished dowel can be adjusted by moving the fence. An easy way to come close to an exact fit is to sight through the infeed (7/16") hole in the first block and adjust the fence so the bit lines up with the edge of the hole in the outfeed (second) block.

One problem we had was trying to insert the 5/16" square blank into the 7/16" round hole of the first block. It doesn't fit. Then we tried inserting the blank into the 7/16" hole as the drill was running. Although there was some resistance, it worked. The four corners were worn down as the blank was pushed into the hole. We also used Hard Maple for the jig to help eliminate wear on the block. — S.K.

DRILL PRESS TABLE SUPPORT

In our cabinet shop, we use a counter-weight on our drill press to take the strain off raising and lowering the table. An old window weight (a cylindrical chunk of lead) acts as a counter-weight to support the table when we adjust the height. And it doesn't cost $75 like some models do.

We attach a wire to an old window weight and slip it down the hollow support shaft of the drill press. The wire is then run through a window weight pulley and connected to the table. The pulley is mounted to a small piece of wood which rests on the top of the hollow column and is positioned so the weight hangs free in the column. The wire runs down the front of the support column and is bolted to the table near the column.

Different size weights are available so you can size them to the weight of the table. With the proper amount of weight, the height of the table can be adjusted with a touch of the fingers.

Ray Stuart
Ray's Cabinet Shop
Ankeny, Iowa

CUTTING CIRCULAR TABLE TOPS

I solved the problem of cutting a circular table top out of a square blank of glued-up lumber by using a router and a trammel point attachment.

I purchased two 36" long steel rods from a local hardware store to replace the rods that came with the trammel point attachment kit. They're inserted between the trammel point and the router.

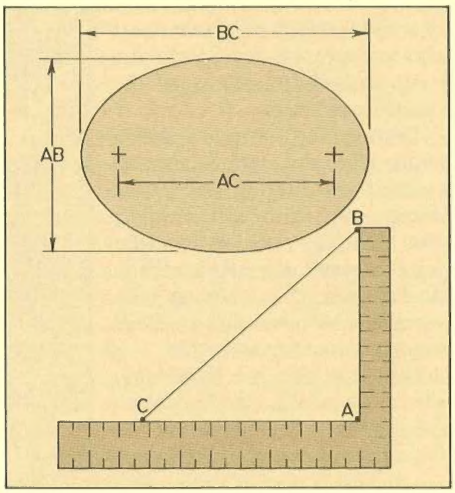
Then I drilled a hole in the center of the bottom of the table top for the trammel point to pivot. Next I adjusted the distance between the trammel point and the router bit so that it would cut a 36" diameter circle. The table top is then cut by lowering the bit in 1/64" increments for each pass.

Frank J. Romeo
Mahapac, New York

ELLIPSE LAYOUT

When I cut an ellipse, I use a steel square to determine how to draw the ellipse to fit the finish dimensions I need.

The width of the ellipse I need, marked AB, is laid out on one leg of a steel square,



and the length of the ellipse (BC) is then laid out as shown.

The distance between the two focal points is found by measuring the distance between points A and C. To find the length of the string, add (to AC) the difference between AC and BC.

O. C. Carlson
Scottsdale, Arizona

SEND IN YOUR IDEAS

We invite you to share your woodworking tips and techniques with other readers of *Woodsmith*. We will pay a minimum of $5 for a tip, and $10 or more for a special technique. All material submitted becomes the property of Woodsmith Publishing Co. Upon payment, you give *Woodsmith* the right to use the material in any manner for as long as we wish.

If your idea involves a drawing or photo to explain it, do your best and, if necessary, we'll make a new drawing, or build the project or jig and photograph it. (Any drawings or photos submitted cannot be returned.)

Send your ideas to: *Woodsmith*, Tips & Techniques, 2200 Grand Ave., Des Moines, Iowa 50312.

Dovetails: The Tools

THE RIGHT TOOLS MAKE ALL THE DIFFERENCE

You really can't talk about dovetails (or even begin to cut them) without getting over two obstacles: fear and joy. The first obstacle (fear) raises its ugly head just when you've taken saw and chisel in hand. It's the moment of truth. And now you actually have to cut this joint that's been a hallmark of excellence for centuries . . . no small undertaking.

Then after cutting one, or two, or a dozen dovetails, it gets in your blood. There's the thrill of feeling the joint go together, of seeing the near perfection of every joint line, of knowing every saw cut was made right on the money, and knowing that, at last, you have joined the ranks of the master craftsmen.

Don't let it get to your head. I think the real satisfaction in cutting dovetails is the actual doing — not the result. Yes, it's true that a dovetail is a beautiful joint, a mark of craftsmanship. And indeed, it is a strong joint — nice for drawers and special applications of case work.

But the thing I like most about dovetails is the actual cutting. So many things in our lives are done at breakneck speed. Do it. Get it done. And then move on to the next task. Not so with dovetails. This is handwork, done the old-fashioned way. It takes concentration. Yet you must be calm and relaxed to get the job done. It's not a task to be undertaken after a hectic day at work. It should be done when there's time. Hopefully a quiet time when you can get absorbed in your work. That's woodworking at its finest.

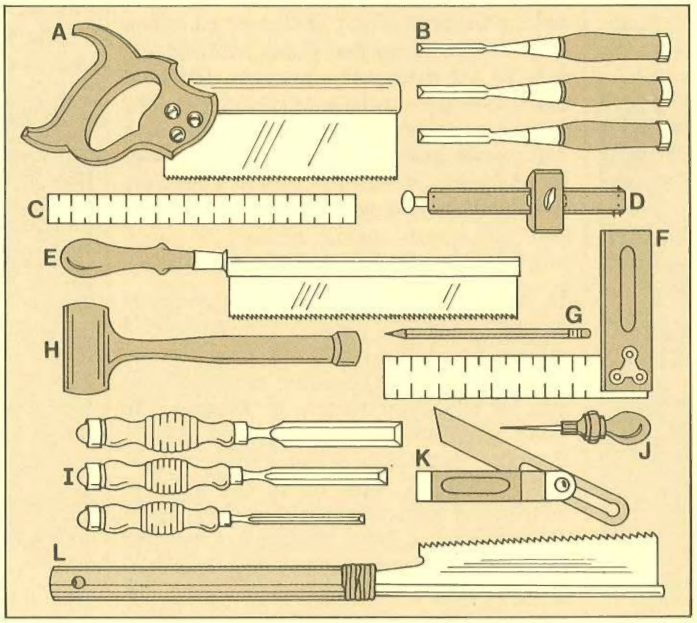
Granted there are ways to speed up the process. Many of the initial cuts can be made on a table saw or band saw. But why? Dovetails, when done with concentration and thought, produce more than a woodworking joint. The result is personal satisfaction.

I almost forgot the third obstacle: the tendency to become long-winded, romantic, and almost poetic about dovetails. So, maybe I ought to come back down to earth and get on with the details of cutting a dovetail joint.

Since I've embraced this rather romantic (translated, that means slow) approach to cutting dovetails, I'd like to mention some of the tools used to undertake this task. Indeed, the proper tools and a comfortable environment make all the difference in the world.

A PLACE TO WORK

Although dovetails can be cut almost anywhere, it's nice to set up a little work area — a place where the work goes smoothly. In our shop I tend to work best on the corner of our large workbench. The bench is heavy and solid so I don't have to worry about things jiggling around.



On this workbench I have set up three aids that help when cutting dovetails. First there's a woodworker's vice (ours happens to be a *Record* vice, purchased from *Woodcraft Supply* catalog, address below). Any vice will work as long as it holds the board in a vertical position.

Second, I attached an adjustable light to the bench. The one I use was purchased at an art supply store, but any kind of lamp that moves where you want it will work. (One of those mechanic's lights with a hook on the end would be nice.)

One other thing that helps is to clamp a small piece of *Masonite* to the workbench. I clamped it on with the rough (back) side up to protect the bench during the chiseling phase and also to provide some friction to keep the boards in place.

LAYING OUT AND MARKING TOOLS

Next come the tools. There are actually two sets of tools used in making dovetails. The first group is used to lay out and mark the cuts. The second group is used to do the actual cutting and fitting.

To lay out the cuts for a dovetail you'll need five tools: an adjustable bevel gauge, a small try square, a steel ruler, a marking gauge, and a scribe or a sharp pencil.

SLIDING BEVEL. Sliding bevels (K in Fig. 1.) are available at almost every hardware store. The 'arm' can be adjusted to any angle and tightened in place with a thumb screw. The sliding bevel is used to make the initial marks for the dovetail .

TRY SQUARE. Most of us have a 6" or 8" try square in the shop, (F in Fig. 1.). It's also nice (but not necessary) to have a smaller 3" try square to mark the straight-line cuts on the end and face of the boards.

STEEL RULER. A good 12" steel ruler is almost indispensable in any woodworking shop, (C in Fig. 1). It's much easier (and usually much more accurate) to work with a steel ruler than fumbling with a tape or a wooden folding rule.

MARKING GAUGE. On page 12 in this issue we've shown the plans for a marking gauge, (D in Fig. 1). We used this one to mark all of the base lines for the dovetails in this issue. If you buy a marking gauge, the point should be reshaped as mentioned on page 12.

SCRIBE VS. PENCIL. The last item you need is up to some debate. The traditional tool used to mark the cut lines is a sharp-pointed scribe, which is just a lightweight version of an awl, (J in Fig. 1). I prefer a sharp No. 3 pencil. Ted uses a fine-point felt-tip pen.

Among traditional woodworkers the mere mention of using a pencil or a pen is enough to make them shiver with disgust. A scribe, they would say, is the only acceptable tool for marking.

If you use a scribe, it should be sharpened to a long slender point to mark (scratch) a fine, accurate line. Of course, this line is almost impossible to see, so it may help to sprinkle some pencil-lead dust (for light-colored woods) or white chaulk (for dark woods) in the scratch line.

But when you get down to it, the line is only there as a guide for cutting. If I can't see it, it doesn't do much good. So, I prefer to use a *sharp* No. 3-lead pencil.

Most pencils have a rather soft No. 2 lead that's nice for writing. The No. 3 (or even a No. 4) lead pencil marks a fine, crisp line that's much easier to see than the

scratch line of a scribe. In fact these harder pencil leads almost scratch the wood just as a scribe does, yet the hard lead leaves a visible line.

The key thing is that the pencil is sharp. Most pencil sharpeners go only so far. After sharpening to get the point, I hone the point on a piece of scratch paper (rubbing and twirling to sharpen the point).

Ted prefers to use a fine-point felt-tip pen. (Here's where the traditionalists scream, "Blasphemy!") There's no doubt that you can see the line when it's marked with a felt-tip pen. And since Ted's dovetails are much better than mine, he must be doing something right. (Ted also uses a Japanese saw and chisel to cut dovetails, and likens the felt-tip pen to the traditional Japanese practice of using a quill and ink to mark their cuts.)

DOVETAIL SAWS

After you've layed out and marked the dovetail, you need only two tools to cut them: a saw and a chisel. The choice of the type of saw and chisel is, once again, fraught with debate. But what it boils down to is a matter of personal preference.

DOVETAIL SAWS. There are several types of saws designed for cutting dovetails. Although they differ in appearance, they do (or should) have a few things in common.

First, a high number of teeth per inch — usually these saws have 16 to 21 teeth per inch (the more the better). Second, a fine or narrow set to the teeth. The finer the set, the less chance of skipping or hopping as the initial cut is made. Third, the saw blade itself is made of thin-gauge steel. This allows for a narrow kerf (if the teeth are set properly). And fourth, since the blade is thin, these saws have a 'back' of thicker metal to keep the blade rigid (hence the name, back saw).

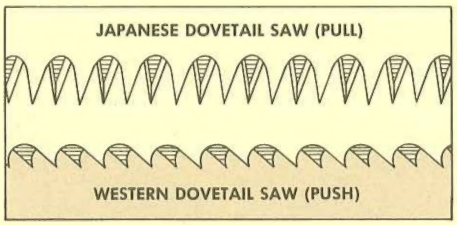
With these things in common, the only real difference between one dovetail saw and another is the handle. A *Tyzack* dovetail saw, for example, has a normal saw handle grip. The Gent's saw (presumably for gentlemen) has a turned handle (much like a chisel) that extends straight back from the saw's 'back.' And finally, there's the Japanese dovetail saw with a long handle extending at a slight downward angle from the saw's back (surprisingly similar to the Gent's saw.)

TYZACK DOVETAIL SAW. So, what saw do you use? My favorite saw for cutting dovetails is the *Tyzack* dovetail saw, (A in Fig. 1). The blade of this saw is only about 0.21" thick, it comes with a very fine set on the teeth (the way it's supposed to be), there are 21 teeth per inch, and just plain does a nice job.

Besides the fact that it cuts with ease, makes an super-fine kerf, and has an easy sure grip . . . besides all that, it's quite a handsome saw. The solid brass back and nicely proportioned handle make it a treasured addition to any tool collection. (Available from *Leichtung* and *Woodcraft* Catalogs.)

JAPANESE DOVETAIL SAW. Ted has a yen for the Japanese dovetail saw (called a dozuki), (L in Fig. 1). The one we have was purchased at a local store, but several catalogs are now carrying Japanese saws (the best is *The Japan Woodworker* Catalog).

These Japanese saws are made of very thin steel (ours is 0.12" thick, or about the thickness of 2 pages of *Woodsmith*!). The teeth are long and narrow (about 24 teeth per inch). The major difference is that all Japanese saws cut on the pull stroke (the teeth point toward the handle), as opposed to the push stroke on all Western saws. This actually makes a lot of sense. As the saw is making the cut, pressure on the blade pulls it taught. This allows the steel for the blade to be very thin (for a very narrow kerf).



If you want to try out the Japanese, I might offer one note of caution. This is a very delicate saw to be used with a very light touch. Let the saw do the work, don't force it. Many Japanese saws wind up with bent and mangled teeth because they're man-handled beyond their limits.

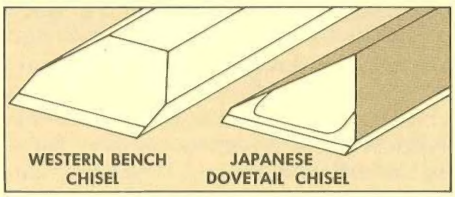
GENT'S SAW. As for the Gent's saw: I'm not particularly fond of these saws (although they're probably the cheapest and most available of the bunch), (E in Fig. 1). However, after trying out the Japanese saw, I did some experimenting on a Gent's saw. I removed the blade from the 'back', flipped it around (so the teeth pointed toward the handle). Then I pressed the teeth together in a machinist's vice to remove most of the set. There was, in my opinion, a dramatic improvement in the saw's action.

SELECTION OF CHISELS

The only other tool you need for cutting dovetails is a good set of sharp chisels, and the mallet or hammer to go with them. And here the selection process is much easier. Any chisel that can be struck with a hammer or mallet will get the job done. (Both *Garrett Wade* and *Woodcraft* Catalogs have a good selection of chisels.)

We have six or seven sets of chisels around the shop. I generally choose the ones that are closest to me at the time — provided, that is, they are sharp.

However, in all fairness, there is one other factor that may influence the decision of which chisel to use. Most bench chisels (including paring chisels and butt chisels) have beveled edges. (This refers to the bevel along the length of the 'back,' not the beveled cutting edge.) This beveled edge makes it much easier to chop out the waste in the angled corners of the dovetail.



Also, some chisels are thinner than others, so it's easier to get the chisel where you want it. For example, we have a set of Ulmia paring chisels which are somewhat thin and nice for cutting dovetails.

Ted likes the special Japanese dovetail chisels. These have steeply beveled backs specifically designed for cutting dovetails. Also, the steel used in these chisels is excellent (see *The Japan Woodworker* Catalog.)

One last point: I tend to like short chisels (like butt chisels) because I hold the chisel by the blade (not the handle) to position it to chop out the waste. Short chisels don't 'wag' around as much, making them easier to put them exactly where I want them.

When it gets down to it, it's not what the chisel looks like, it's the very tip, the cutting edge, that does the work. Above all, the chisels must be sharp. All of the chisel work on dovetails is done with the chisel set across the grain and chopping straight down. The *only* way to do this is with a *sharp* chisel.

HAMMER OR MALLET. For a long time I used a wooden mallet to drive the chisel into the wood. It seemed only proper. But the turned type of mallet (the kind wood carvers use) has a tendency to roll off the bench and find its way to one of my toes.

Recently, I've come to use the *Stanley No-Mar* hammer, (H in Fig. 1). This is a light-weight hammer (14 oz.), yet has enough heft to drive the chisel as far as I want it to go. It's made of some kind of black plastic material and the head is filled with lead pellets and oil. Plastic or not, it's a nice hammer and quite nice for pounding the joint together during the final fitting (it won't dent or mar the wood).

SOURCES: If you can't find some of the tools listed above at a local store, you may want to send for some of the following catalogs: *Garrett Wade*, 161 Avenue of the Americas, New York, NY 10013, 1-800-221-2942. *Leichtung Workshops*, 4944 Commerce Pkwy, Cleveland, OH 44128, 1-800-321-6840. *Woodcraft*, 210 Wood County Industrial Park, Parkersburg, PO Box 1686, WV 26102-1686, 1-800-225-1153. *The Japan Woodworker*, 1731 Clement Avenue, Alameda, CA 94501, 1-800-537-7820.

Dovetail Joinery

AN OVERVIEW OF HOW TO LAY OUT THE CUTS

Once you've collected the tools to do the job, it's time to start laying out the cuts. There are three basic variations on the dovetail joint: through dovetail, half-blind, and mitered (or full-blind).

Although much of the process is very similar for all three variations, we're limiting this article to through dovetails. Half blind dovetails (which are used mainly in drawer construction) will be covered in the next issue. And mitered dovetails won't be covered at all because they have extremely limited application (and they're really kind of a waste of time).

THROUGH DOVETAILS. The method described here for cutting through dovetails may not be the best. It's certainly not the fastest. But it is satisfying work . . . done with hand tools.

A through dovetail joint consists of two halves: the pins and the tails. The worst part about laying out a dovetail is getting a clear picture in your mind of what these two halves look like and how they fit together. This just takes a little getting used to.

When viewed from the face sides of the boards, the *pins* of the dovetail (the board on the right in the photo) look just like the rectangular pins of a box joint. The *tails* (the board on the left in the photo) look like a dove's tail (hence the name of the joint).

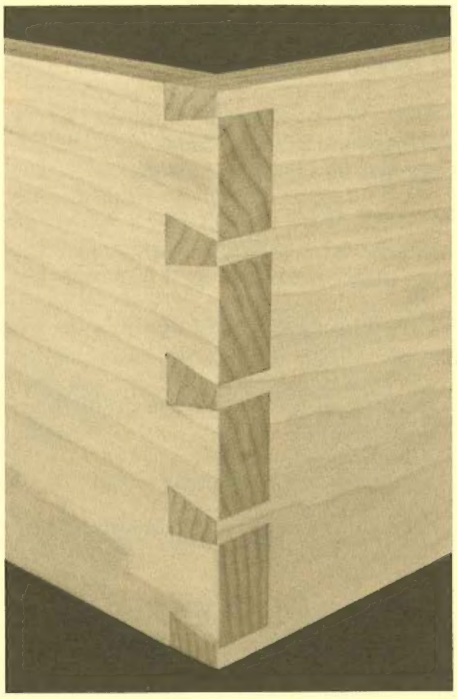
Just to keep you on your toes, when viewed from the ends of the boards the pins look like tails, and the tails look like pins. But this confusion will clear up after you've cut one or two dovetail joints.

DIRECTION OF STRENGTH

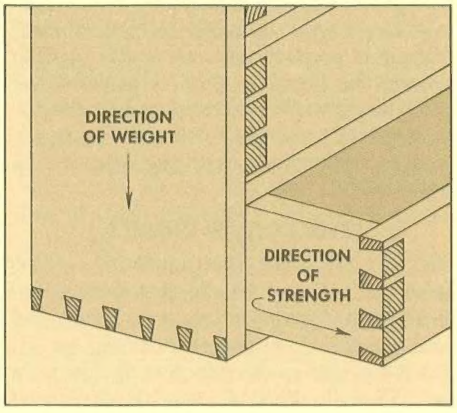
Now the question arises: Which board gets the pins, and which board gets the tails? And does it make any difference? Although a dovetail is commonly considered a very strong joint, it is only strong in one direction. (Here I mean the mechanical or interlocking strength of the joint. Once it's glued up it's nearly impossible to get apart in any direction.)

The direction of strength is toward the pins. To illustrate, refer to the drawing at right. Dovetails are normally used to join four boards at right angles to form a box. If this joint were on a drawer, for example, the pins would be cut on the drawer front where the mechanical strength of the joint holds the drawer together as it's pulled open. If the joint were on a wall-hung cabinet the pins would be cut on the bottom which is the direction of the weight of the contents.

However, the direction of mechanical



strength of the joint may not be the primary consideration. If the box is meant to support weight from the outside (as with the Shaker Step Stool in this issue), the direction of pressure (or weight) is more important. This has to do with the size and placement of the tails. The tails, in this case must be wide enough to support the weight (downward pressure) on the face of the board, and positioned so they take the brunt of the weight.



In some cases both direction of strength and direction of pressure must be considered — as with the coffee table in this issue. The pins are on the legs to keep them from splaying out, which works out nicely because the tails must be on the top to support the weight.

THE FIRST THREE STEPS

What's the first step in laying out a dovetail? At this point I'm supposed to launch into a discussion about pins and tails, and angles, and such. But the first step (indeed, the first three steps) have nothing to do with pins, tails, or angles.

1. TRUING THE BOARDS. The first (and often neglected) step is to true up the boards you'll be working with. I rip the boards to width, making sure both edges are ripped square. (The edges can be smoothed on a jointer or with a hand plane, but I usually wait until after the dovetails are cut for the final smoothing.)

Next, both faces of the boards should be planed or sanded to remove any defects (such as 'ripples' left by a surface planer), or to remove any 'cup' or twist in the boards. Also, make sure the thickness (particularly at the ends of the boards) is equal from one edge to the other.

In other words, the boards should be flat and smooth — to the point that all they need is a little finish sanding. This will ensure things don't get goofed up during the layout phase.

2. CUT TO LENGTH. Now the boards can be cut to length. However, the final length of each board depends in part on step three (which deals with marking the base line, or shoulders of the joint). But for now, let's assume the boards are cut to length for a box. The key thing here is to make sure the ends of the boards are cut square with the edges.

If neither the inside or outside dimensions of the box is absolutely critical, then the boards can be cut to length without much concern if the actual final dimensions vary a little.

However, in drawer work, especially when the drawer must fit in a specific opening, the procedure followed in Step 3 must be taken into consideration first.

If all of this is too much, the real point of Step 2 is to make sure the ends of all boards are square with the edges.

3. MARK THE SHOULDERS. The boards are true, the ends are cut off square. Now all that remains is marking the base line (the shoulders) of the pins and tails. This base line is actually the bottom of the cut on both pieces, and in effect dictates the final dimensions of the box.

The base line also dictates the amount of work you must do during the final cleaning up stage. Without getting bogged down in too much detail, you have three choices. The base lines can be marked exactly at

the thickness of the boards, or a tiny smidgen more than the thickness, or a tiny smidgen less.

How the base lines are marked is important for two reasons. The base lines determine the final measurements (the final length) of the boards you're joining together. If you're building a drawer, for example, this measurement becomes critical because the distance between the base lines actually determine the final width of the drawer.

The second reason has to do with the amount of work you have to go through to clean up the finished joint. Let's say, for example, that you're going to build a drawer. All four corners are joined with through dovetails. The pins are cut on the drawer's front and back, and the tails are cut on the sides.

The basic procedure for marking the base lines is to use the thickness of the board for the tails (in this case, the sides) to set the marking gauge. Thus, when the base line is marked on the drawer's front, the distance between the base line and the end of the board is equal to the thickness of the drawer's sides.

Most books say to set the marking gauge a little more (just a hair more) than the thickness of the second board (the drawer's side). The result is that the pins will stick out just a hair beyond the face of the sides when the joint is complete. They must then be cut, filed or planed down flush.

I like to mark the shoulders just a tiny smidgen less than the thickness of the second board. This means the ends of the pins are recessed slightly. To clean up the finished joint, it's now quite easy to use a plane to clean up the joint. After planing the sides a little bit, the plane gets down to the end grain on the pins, making it nice and smooth. Also you'll be removing the shoulder (scratch) line at the same time.

GENERAL LAYOUT

By this time you're probably getting tired of reading all this preliminary stuff about dovetails. But I would like to make a few more general comments concerning layout.

Laying out the joint — the size and placement of the pins and tails — is well worth some time and thought. If you rush into the actual cutting, you may end up with a joint that's cut precisely, but looks clumsy, or worse . . . boring.

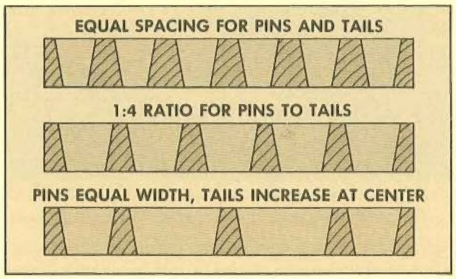
The best procedure is to draw the pins and tails on a piece of paper (or on some scrap wood). You should mark out all the details of the size and placement — and feel comfortable with them — before taking saw in hand.

MARKING THE PIECES. After cutting the pieces to size and truing them up, it is very helpful to mark the inside and outside faces of each board to avoid confusion. I simply write in large letters "IN" and "OUT" near the end of each board where the dovetail is to be cut.

Most of the time you'll be cutting dovetails on several boards to form a box or drawer. Since this is all handwork, the size of the pins and tails will undoubtedly vary from board to board. It's best to clearly mark the two boards (the corners) that will go together.

WIDTH OF PIN VS. TAIL. One way to lay out the cuts for a dovetail is to use a ruler to divide the board for the pins into equal spaces. Then the pins and the spaces between the pins (which will be the tails) are laid out at equal widths. This is easy, but very boring. Since the pins and tails are nearly the same size, the dovetails look as if they are machine-made, as shown at the top in the drawing.

It's a matter of individual preference, but I prefer the pins to be quite narrow compared to the tails. As a general rule I use a minimum 1:4 ratio for the relationship between the pins (1) and tails (4). For



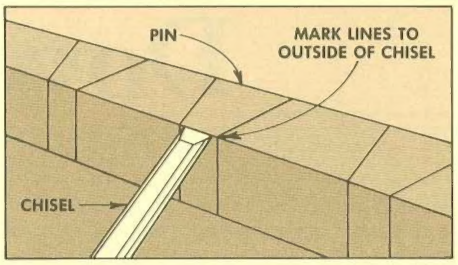
example, if the narrowest part of the pins (the outside face) is ¼" wide, then the tails should be at least 1" wide.

When it seems appropriate, I think it's nice to keep all the pins the same size, but vary the width of the tails. The tails nearest the edges of the board are the smallest, while those on the middle of the board are wider. (The layout of the joints on the Coffee Table are done this way.)

As you lay out the position of the pins, there should be a half pin on the two outer edges. (Half pins are not necessarily one-half the width of any other pin, it's just that they're cut on only one side). The position and spacing of all the other pins (those between the two half pins) is a matter of choice.

After laying this all out on paper, I transfer the marks for the position of the pins with a 12" steel ruler. These marks will indicate the narrowest width of the pins. However, you can save a lot of hassle later if the narrowest part of the pins is marked off with the chisel you're going to use to chop out the waste.

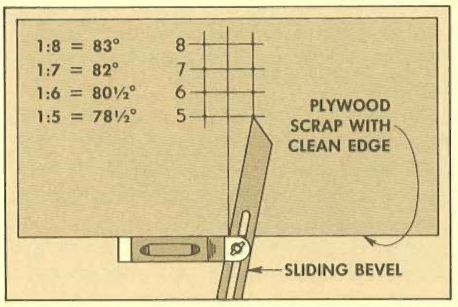
As shown in the drawing (above, right), the marks are placed just a smidgen outside the width of the chisel to allow some room. (This method is discussed more in the section on cutting the tails.)



ANGLES. The last consideration is the angle used for layout. The general rule is that a 1:5 angle is used on soft woods, and a 1:7 or 1:8 is used on hardwoods. The difference has something to do with the strength of the wood.

I prefer a 1:5 angle on any wood just because I think it looks nice. Once again this a matter of personal (visual) preference. A 1:5 angle translates to 78½°, while a 1:8 angle is about 83°. That may seem like nit-picking, but there is a definite visual difference. Anything less than 1:5 makes the 'neck' of the tails look disturbingly weak, while more than 1:8 looks like a box joint.

To set the sliding bevel at the proper angle, I use a small piece of plywood. First, draw a line exactly 90° to a good clean edge. Along this line mark a point 5" (or 8", or whatever you want) from the edge. Then draw another line perpendicular to the first one, and mark a point 1" to the left or right. Position the body of the sliding bevel along the edge of the plywood and then adjust the arm to the mark that gives you the angle you want.



PINS OR TAILS. Which do you cut first, the pins or the tails? In the case of through dovetails, it's generally accepted that it doesn't make much difference which is cut first. However, I mark and cut the pins first for three reasons.

First, I think the pins are easier to cut and I like to get started with the easy part. Second, whichever half is marked first (the pins in my case) is used to mark the lines for the second cuts (the tails). I think it's much less awkward to position and hold the boards if the pins are cut first and used to mark the lines for the tails. The third reason is that I find it easier to check the accuracy of the finished cuts on the pins (and do any correcting) than it is with the tails.

Now you're ready to cut the pins.

Dovetails: The Pins

THE FIRST STEP BEGINS WITH THE PINS

Most of the preliminary work for laying out a dovetail joint has been covered in the article on the previous two pages. Once all of these details have been worked out on paper, it's now just a matter of transferring these measurements to the end of the board, and start cutting the pins.

Before you start marking, however, the first three steps remain the same. That is, 1) true the boards your working with, 2) cut them to length (making sure the ends are square to the edges), and 3), mark the base lines. For the pins, the base lines need only be marked on the two faces of the board, see Fig. 1.

LAYING OUT THE PINS

To mark the position of the pins, I clamp the board in a vice with the "OUT" side of the board facing me. Since I've already worked out the size and position of the pins on paper, it's now just a matter of transfering the marks with the aid of a 12" steel ruler, Fig. 2. (This is where it's helpful to use a chisel to gauge the width of the pins.)

MARKING THE ANGLE. Next the sliding bevel is set to the proper angle (I use 1:5). Place the point of a very sharp pencil (or scribe) on the mark at the very edge of the board. Then move the sliding bevel up to the point of the pencil, and mark the angle. The result should be a bunch of triangles, all pointing toward you (the "OUT" face of the board), Fig. 3.

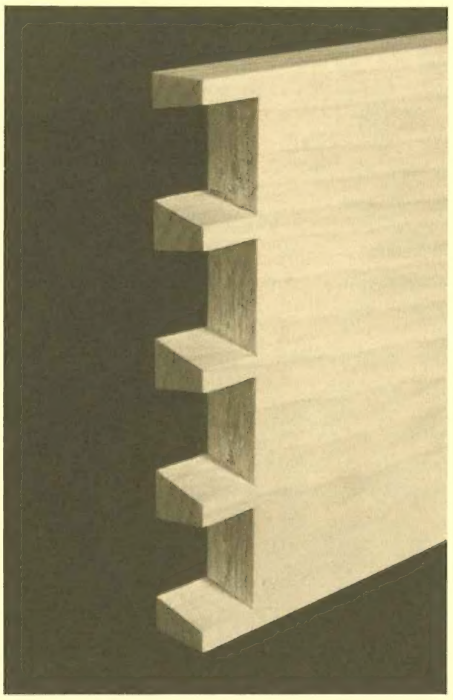
MARK VERTICAL LINES. Now use a try square to mark vertical lines on the "OUT" face of the board. These lines are used as guides for cutting and should stop right at the base line, Fig. 4.

Finally, just to keep things from getting confused (which often happens) I mark an "X" on the waste sections between the pins.

SAWING THE PINS

Now you're ready to take saw in hand. Stop everything. Relax your hand, your arm, your shoulders and especially your mind. The way to get the best results is to relax, yet concentrate on what you're doing. Place the saw on one of the lines.

The placement of the saw and the first two gentle strokes will determine the success of the rest of the cut. Look closely at the teeth of the saw. Because the teeth have 'set' (that is, alternate teeth are bent to the right and left), you'll only see half of the teeth. Place one tooth right up against the waste side of the pencil line. That is, so the kerf will be on the waste side (the "X" side) of the line, see Fig. 5.



The saw should be angled (about 45°) so your first cuts will be on both the face and end of the board. Now, relax your hand and make the first two strokes.

The kerf should be skimming along the pencil line. Since the teeth of a dovetail saw have very narrow set, these beginning two strokes will hold the saw in position for the rest of the cut. If you're not on the line to begin with, any attempts to force the cut or make adjustments in mid-stream will cause the saw to bind and will lead to all sorts of problems.

After a few strokes the saw should be about ⅔'s of the way down the face and ⅔'s across the end, see Fig. 6. Now you can level out the saw so it starts cutting through to the back of the board. Continue sawing until the saw just barely touches the base lines. (All the time your hand should be very relaxed, just barely holding the saw. Relaxed, yet concentrating.)

If you're going to goof on these cuts, it's best to goof on the waste side of the line. That is, the saw should leave a little extra wood between the kerf and the pencil line. (If there is a problem, let it go for now. It can be corrected later.)

CHOPPING OUT THE WASTE

After making all of the saw cuts, you can start chopping out the waste. One way to do this is to hold the chisel absolutely perpendicular to the board, and chop straight down on the base line. But there's a problem. The natural tendency of the chisel is *not* to go straight down, but rather to undercut the shoulder.

No matter how careful you are, or how gentle the first cut, the beveled front edge of the chisel will act as a wedge to force the cut back, away from the base line. One solution to this is to carve out a small V-shaped section along the base line. This removes the wood on the bevel side of the chisel, and prevents the wedge action.

An even better way (for me) is to clamp a backing fence along the base line, Fig. 7. Although this is time-consuming, it provides a sure rest for the chisel and prevents undercutting on the first few strokes. Now, chop straight down at the base line. Don't get carried away. One or two medium size taps are all that's needed at first. Do this along the base line of each waste section.

CLEAN OUT WASTE. To clean out the waste, hold the chisel (bevel up) on the end of the board and make a small tap, Fig. 8. This should cleanly remove a little chip of waste (about 1/16" thick).

UNDERCUT. After chopping straight down for about ⅛", you can start undercutting. Hold the chisel at a slight angle (tilt the handle toward you). This forms a slight V-cut on the bottom of the shoulder, Fig. 9.

OTHER SIDE. After chopping down about ⅔'s of the way through the board, flip it over. Position the backing fence once again, and proceed as before, Fig. 10. However, be very gentle with the hammer — too hard a whack may slice through to the "OUT" face.

CLEAN OUT CORNERS. Since the saw kerf may not have gone all the way to the base line, and because the V-cut of the chisel is actually below the base line, there will be little splinters of waste in the corners. These "dirty" corners can cause a lot of problems, so it's important to clean them out with a sharp chisel, Fig. 11.

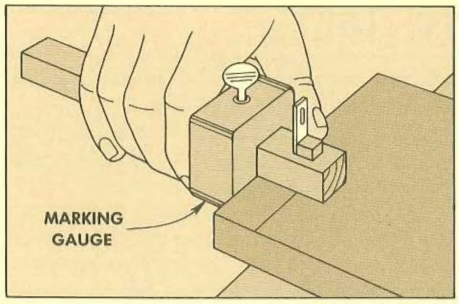
CHECKING THE PINS. After all the cuts have been made, hold a try square along each cut line (both front and back) and make sure the edges of the pins are perpendicular to the end of the board.

If the pins are not straight, I mark a slightly heavier line (as in Fig. 4) and correct them by paring down with a fairly wide sharp chisel, Fig. 12.

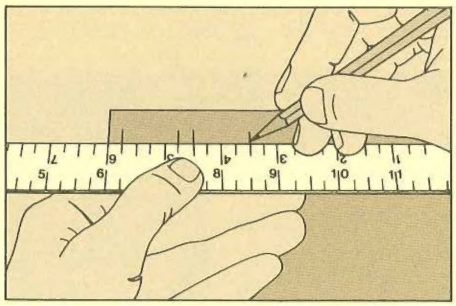
You can also check the pins by eye, sighting down the length of the board to see if the pins are all straight and parallel.

Next comes the tails.

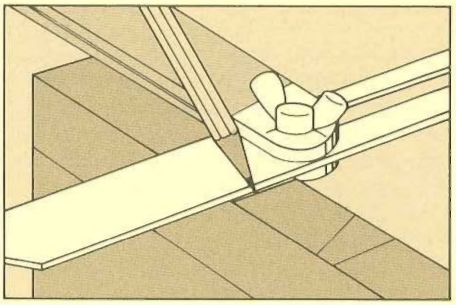
Step By Step



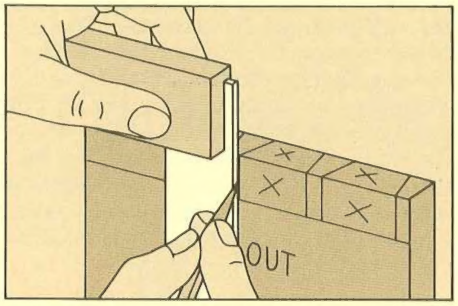
1 *Make sure the boards are true and the ends are square. To mark the base line of the pins, set the marking gauge to the thickness of the board for the tails.*



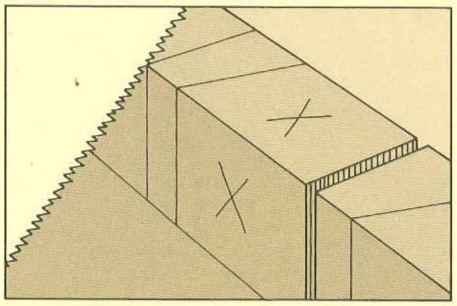
2 *Work out the details of the size and spacing of the pins on paper. Then clamp the board in a vise with the "OUT" face toward you and transfer the marks.*



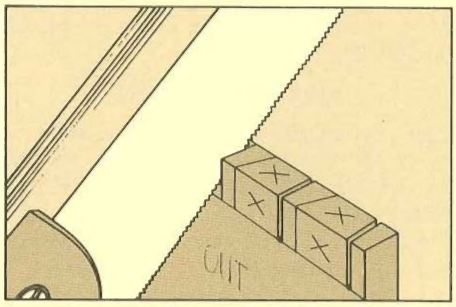
3 *Set the sliding bevel to the angle you want (I use 1:5). Hold pencil on mark, slide arm up to point of pencil, and mark the angle on the end of the board.*



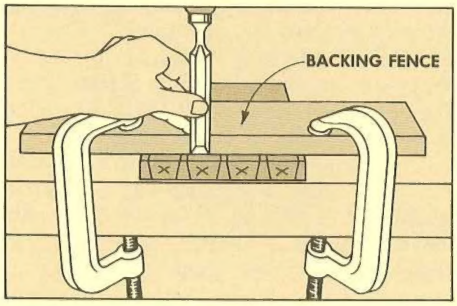
4 *The pins are the "triangles" pointing toward you. Mark the vertical lines down to the base line, and then mark the waste sections with an "X".*



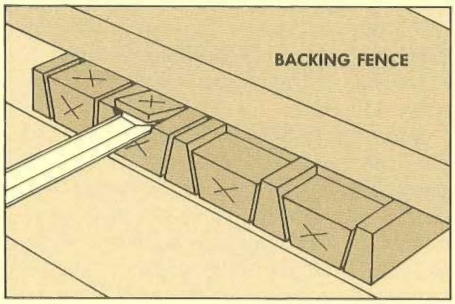
5 *To cut pins, use a fine-tooth dovetail saw. Place one tooth up against the pencil line. Saw should be angled so cut is made on face and end on the first strokes.*



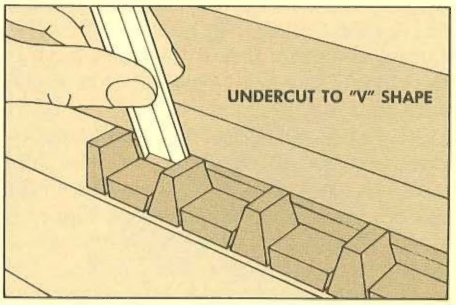
6 *Saw about two-thirds of the way down the face and across the end, skimming along the pencil line. Then level out the saw to cut on the back side.*



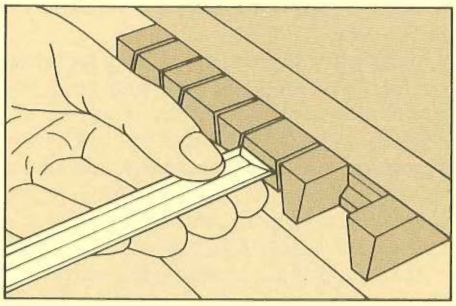
7 *Clamp a backing fence along the base line. Hold chisel vertically and tap straight down on base line. Make sure backing fence doesn't move .*



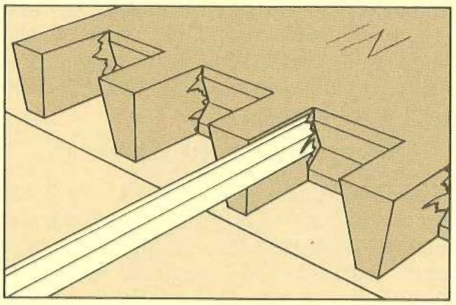
8 *Hold chisel (bevel up) about 1/16" down from edge. A gentle tap should clean out waste. Then tap straight down on base line and remove second layer of waste.*



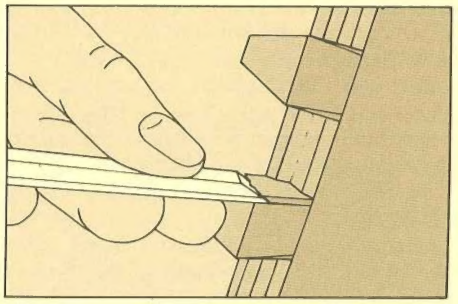
9 *After removing about 1/8" of waste, tilt chisel handle slightly toward you to undercut the shoulder. Board has "OUT" side up so waste can be chipped out easily.*



10 *Flip board over (so "IN" side is up). Once again position backing fence and chop straight down on base line. Then undercut to remove the rest of the waste.*



11 *Since the V-cut is below the base line (and thus below the saw cuts), there will be little splinters of waste in the corners that must be cleaned out.*



12 *The pins must be exactly perpendicular to the base line. Check both faces with try square and straighten out any bad saw cuts with a chisel.*

Dovetails: The Tails

COMPLETING THE JOINT WITH THE TAILS

It may seem like you've completed a monumental effort just getting the pins cut and cleaned up — especially if you're cutting dovetails for a whole set of drawers. But now it's time to move on to the tails.

All of the waste you just removed from the board with the pins must be filled with something . . . the tails. Before marking the cuts, however, the base line (or shoulders) must be marked, Fig. 1. Since there's a half-pin on the outside edges of the first board, there must be a complementary recess (or waste section) on the board for the tails. This means that the edges must be marked (as shown in the drawing) as well as the face of the board.

MARKING THE CUTS

The pins on the first board are used to mark the cut lines for the tails on the second board, Fig. 2. As you hold the boards in position for marking, make sure the pins (on the "IN" face of the board) are right on the base line.

In order to mark the cut lines for the tails, you should work from the inside corner formed by the two boards, as shown in Fig. 3. If you were to mark the line from the outside, the point of the pencil would naturally want to fall into the grain pattern and 'straighten out.' By going to the inside corner, the grain forces the point against the edge of the pin — exactly where you want it to be.

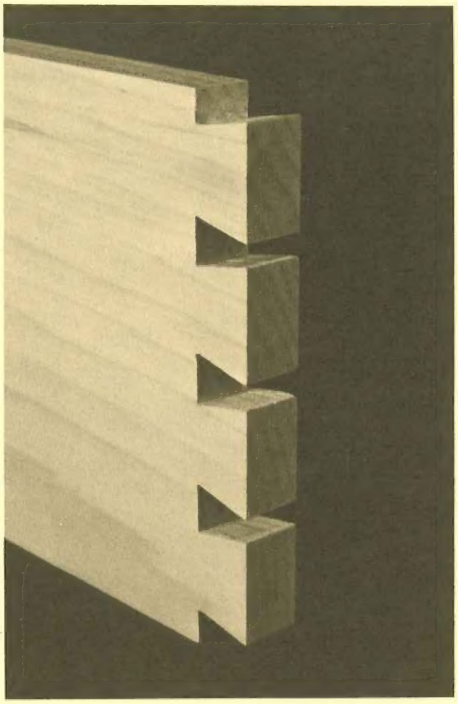
No matter what kind of marking instrument you use (pencil, scribe, or a rusty old nail), the marked line will always be on the 'good' side of the cut. Look at Figure 3 again. What you're marking is the waste section where the pins will reside as the joint goes together. Notice that the marked line is on the 'good' side. In other words, you'll want to leave this line.

There's another dilemma here. When marking the cut lines for the tails, you're marking on the "IN" side of the board. However, the pin will actually go all the way through to the other side (to the "OUT" side), and that's where the two corners must actually touch. This is why it's so important for the pins to be absolutely straight — from tip to shoulder.

MARKING THE ENDS. Once all the angled lines are marked on the "IN" face of the board, use a try square to carry them across the top (end grain) of the board. Once again, it's best to clearly mark the waste sections.

SAWING DOWN THE LINES

Now we get to the hard part. You have to



make an angled cut that just barely skims off part of the pencil line. This cut is difficult for two reasons. First, you're cutting along the "IN" side of the board — the side that won't show in the final assembly. The other side of the board (the "OUT" side) is what will show.

Second, the saw must be tilted to the same angle of the cut. What usually happens to me during these cuts is that I tend to saw straight down. Fortunately, this means the kerf stays on the 'waste' side of the cut. But it also means it's not where it's supposed to be. To help with this problem, I angle the board in the vice so the cut line is almost vertical.

Now, place one tooth of the saw up against the marked line. This placement will actually be taking the tiniest smidgen too much (remember the line is on the 'good' side). That's okay, because you need a little (but not too much) clearance for the joint to go together.

REMOVING THE WASTE

After you've sawn down all the cut lines, the waste can be chopped out. Here the same procedure is followed as it was for the pins: clamp the backing fence along the base line, chop (gently) straight down, and chip out the waste.

This is where using the chisel to mark the width of the pins comes into play. When the waste is chipped out, there must be enough room to get the chisel between the corners of the tails, Fig. 6.

After chipping out the waste about ⅔'s of the way down, flip the board over and continue on the other side, Fig. 7.

THE ENDS. Notice the waste sections for the two half pins on the outside edges of the board, Fig. 7. Here I've chopped straight down on the base line, however, no undercutting was done. The shoulder that's formed will be visible, and you want it to be straight across.

After the waste sections in the middle of the board are chipped away, the waste for the half pins can be removed. Turn the board on edge and chop straight down on the shoulder line (it was marked in Fig. 1). Then pare out a small V-cut, Fig. 8. Finally, saw down this shoulder line to remove the waste, Fig. 9. Since the saw cut may not be very clean, pare off the roughness with a sharp chisel. And while you're at it, go ahead and clean up the corners in all the waste sections.

ASSEMBLY AND FINISHING

Now comes the moment of truth. Position the tails over the recesses between the pins. To get even pressure across the board, place a striking board on top, Fig. 10 and tap the joint together.

You see, every joint line fits perfectly. Oh, there may be a few little places where the kerf is too wide, but these voids can be filled during the finishing stage.

The one problem you want to be careful of is the joint being too tight in some places. This will cause the wood to split. So, tap the joint together gently, checking for overly tight joint lines. If there are tight spots, knock the joint apart and pare off some of the excess from the tails.

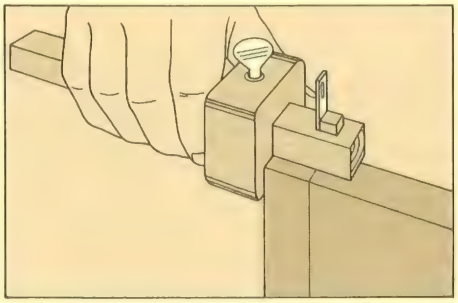
When the joint fits properly it can be admired as it is, or glued up to finish the project you're working on. Only a small amount of glue is needed (I usually apply it to the pins.)

CLEANING UP. Once the joint is together, the end grain of the pins and tails will either stick up above the face of the boards, or be somewhat recessed. If it's recessed, you can use a plane to shave the face of the boards down, eventually getting to the end grain of the pins and tails, making them smooth, Fig. 11.

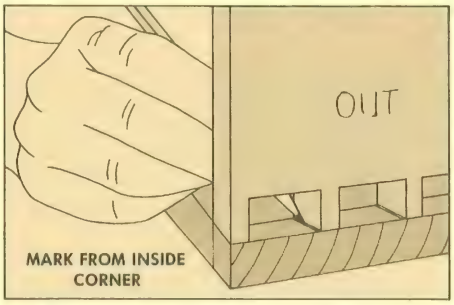
If the end grain is above the surface of the boards, it can be leveled with a file. To protect the surface of the boards, place some heavy paper (from a grocery bag) in the path of the file, Fig. 12.

That's it, a perfect dovetail!

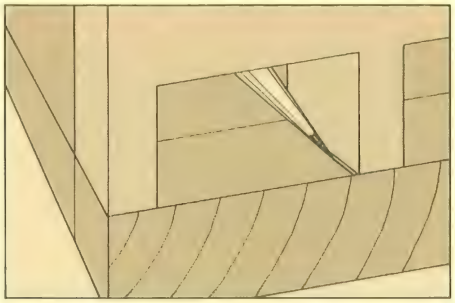
Step By Step



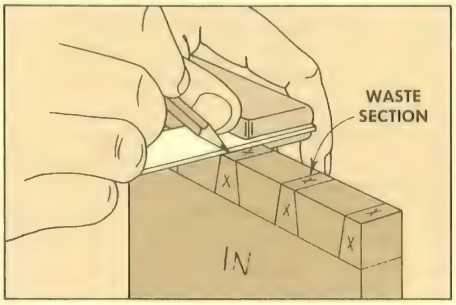
1 *Make sure board for tails is true and ends are square. Then set marking gauge to thickness of board for pins. Mark base lines on both faces and both edges.*



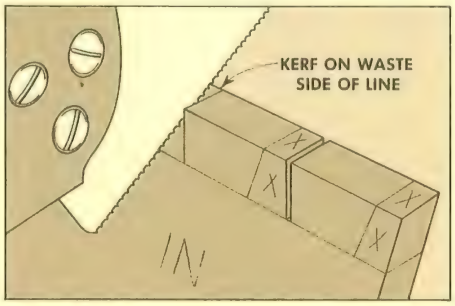
2 *To mark cut lines for the tails, use the board for the pins as a template. Place pins on base line and mark from the inside corner with a sharp pencil or scribe.*



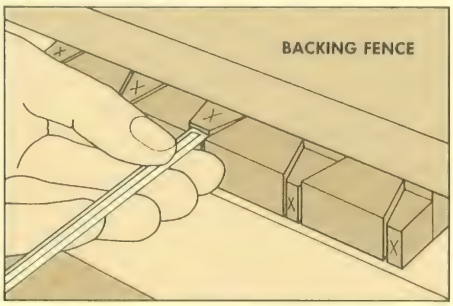
3 *Notice the small gap between the pin and the pencil line (on the "good" side of the cut). The saw cut should remove this gap to allow a little room for clearance.*



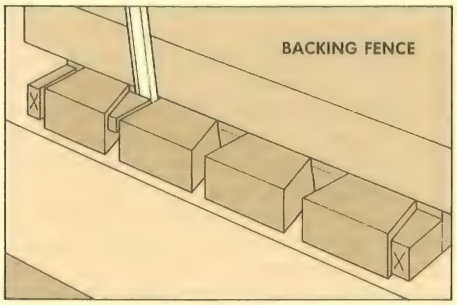
4 *Hold pencil on corner of board and move try square up to it. Mark lines straight across on the end grain. Then mark the waste sections with an "X".*



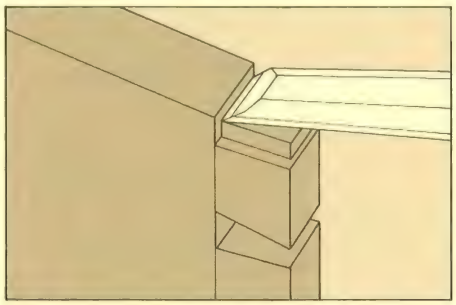
5 *Angle board in vise so lines are almost perpendicular. Place tooth of saw right up against the pencil line (so kerf is on the waste side) and make cut.*



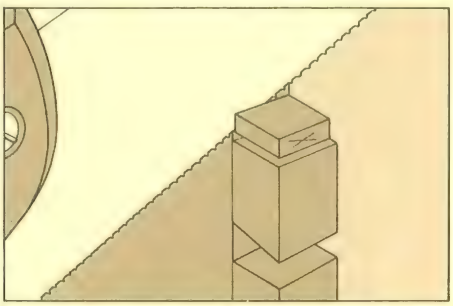
6 *Clamp backing fence along base line and chop straight down. Then chip out waste. Note that waste should be slightly wider than the chisel for easy removal.*



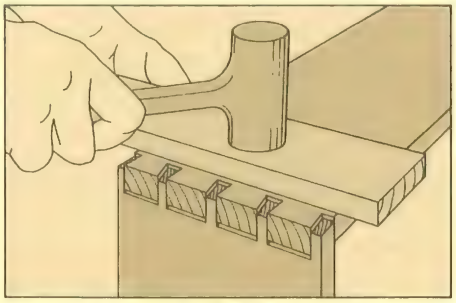
7 *Flip board over and align backing fence to chip out remaining waste between tails. Only straight down cuts are made on half-pins (don't undercut).*



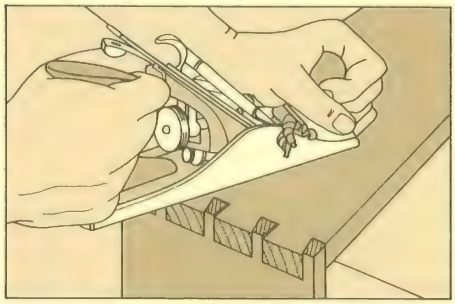
8 *To clean out waste for half-pins, chop straight down on shoulder line (marked in Fig. 1). Then pare out a small V-notch so saw rests against this shoulder.*



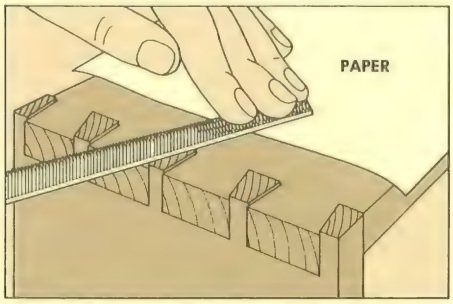
9 *Place saw against shoulder of V-notch and saw off waste for half pin. This saw cut will be somewhat rough so clean up the shoulder with a sharp chisel.*



10 *After corners of tails are cleaned up the joint can be tapped together. Use a backing board for even pressure. As joint goes together, check boards for splitting.*



11 *If base lines were marked less than the thickness of second board, the pins and tails will be recessed. Use a plane to shave board down to the end grain.*



12 *If the pins and tails stick up above the surface of the boards, use a file to level them off. Heavy paper protects the face of the boards from scratch marks.*

Shop Notes

SOME TIPS FROM OUR SHOP

As we were working on the projects for this issue, a few things came up that we thought would be nice to include. Since there never seems to be enough room in the articles for the projects, we gathered together some of these tips for this page.

STARTING OUT WITH DOVETAILS

When you set out to cut dovetails for the first time, the wood you choose can mean the difference between nerve-racking frustration and bone-rattling anger. (Let's face it, the first time out is not going to be easy.)

There are a couple of wood species that can make the job a little easier. Poplar would be my first choice. It's relatively inexpensive (so your wallet doesn't hurt so much if you blow a cut). Also, it's light in color so the marked lines are easier to see.

The key thing, however, is that Poplar is just hard (dense) enough to offer a good feel with hand tools. Yet, not so hard that you have to struggle just to make the cuts and chisel out the waste.

Some other good choices would be Soft Maple and Alder (on the West Coast). If none of these woods are available, you might be able to find some Philippine Mahogany (usually called Luan) at almost any good lumber yard. The only drawback is the dark color makes it a little more difficult to see the cut lines. But if your choice is between Luan and pine, I'd choose Luan to cut dovetails.

By all means, stay away from Hard Maple. My first attempt to cut dovetails was in Maple — an event I'll always remember.

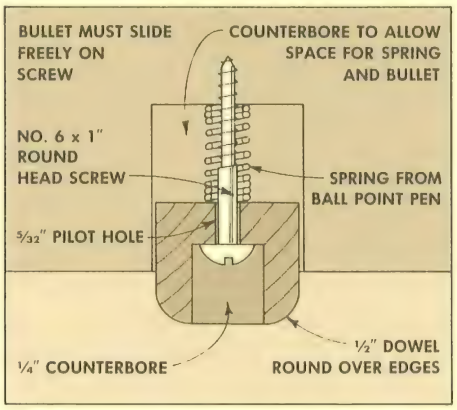
SHOP-MADE BULLET CATCH

As we were building the Contemporary Coffee Table shown in this issue, one of the biggest problems we had was coming up with a drawer-stop system. As mentioned in the article, we finally came up with a system using bullet catches.

These catches are relatively easy to obtain, but we didn't happen to have any in the shop to experiment with. So we made our own. It turned out kind of nice. (I say that because our version is made of wood instead of metal, and I have an affinity for anything made out of wood.)

As shown in the drawing, the catch is basically just a little chunk of ½" dowel with a round-head screw and a spring from a ball-point pen. Although we used this catch on drawers, the most common application is on the doors of a cabinet.

To make it, I drilled a ¼" counterbore in the end of a 3" long dowel. (It's easier to work with this length to start.) Then I switched to a 5/32" bit for the pilot hole. Next, the dowel was chucked in the drill press and I used a file to round off the end. Finally, I cut the ½" long bullet off the end of the dowel.



The bullet is mounted by drilling a ½" hole in the project. When drilling the mounting hole, be sure to allow enough room for the compressed spring (experiment a little on some scrap wood). If this catch were mounted in a door, you'd have to drill a shallow dish-shaped hole to trap the bullet as the door is closed.

OIL FINISH FOR DOVETAILS

I'm always amazed at what you can learn by reading the labels on cans — especially on cans of finishing products. I guess I never expect to see anything but the usual "Stir well before using."

As you've probably noticed in the past issues of *Woodsmith*, one of my favorite finishes is *Watco* Danish Oil Finish. Without going into all the advantages and disadvantages of this product, I'd like to mention one of the finishing techniques we use to finish projects joined with dovetails — and why *Watco* oil is so helpful.

Very few woodworkers can cut *perfect* dovetails *every* time. There are bound to be small voids no matter how hard we try. Naturally, these voids must be filled — hopefully in a way that doesn't scream "That joint was filled!"

The solution to this problem is right on the back of the *Watco* can. It says, in part, "Apply a liberal amount of *Watco* oil with a brush, roller or cloth. While the surface is still wet with *Watco* oil, wet sand with 600 wet or dry sandpaper. Wipe dry. After one hour, apply a second application of *Watco* oil allowing 15 minutes penetration. Then wipe completely dry."

Not only did they manage to mention the name *Watco* three times in four sentences, but they offered a nice finishing tip. After reading this, I couldn't resist experimenting a little bit.

What I came up with is this. Apply a liberal amount of oil (just like they say) then sand with 220 grit (instead of 600) silicon carbide (*Wet-or-Dry*) sandpaper. As you sand you'll create kind of a goopy mess of sawdust and oil. Keep sanding and adding oil until there's enough of this goop to fill in the voids in the dovetails.

This sawdust/oil mixture will dry very hard, and it almost perfectly matches the end grain of the pins and tails. It takes a keen eye to see that the joint was filled at all.

I've been using this technique for about three years now, and it works beautifully. It's especially nice on open-grained wood (like oak or walnut) because the 'goop' acts as a wood filler to fill the pores as well as voids in the dovetails.

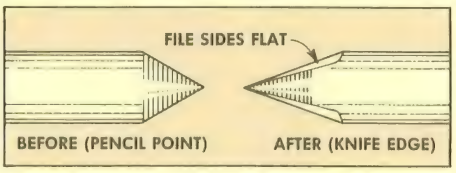
MARKING GAUGE

When laying out dovetails, there are several ways to mark the base line for the pins and tails. But the best way is with a marking gauge. It makes a nice crisp line right where you want it.

We have four or five marking gauges in the shop. One is a nice new $40 rosewood and brass 'store-bought' model. I'm also very fortunate to have the marking gauge my grandfather used during his life as a cabinetmaker. This hand-me-down is not very fancy, but it taught me a lesson worth more than the 40 bucks I spent on the 'store-bought' one.

The pin on the $40 model is sharpened just like the point of a pencil. When you mark a line with it, the point tears the wood producing a rather jagged line.

I'm sure my grandfather's gauge was shaped the same as when it was new. But he reshaped the point of the pin to form a



knife edge (in fact, you can still see the file marks on the arm). This shape slices the fibers of the wood, producing a smooth crisp line.

I may be prejudiced, but I reshaped my $40 gauge the same way and I'm much happier with its performance.

Marking Gauge

A REAL PENNY PINCHER

One of the nicest things about woodworking is having the chance to make your own tools. Granted, it's a wee bit difficult to build something like a table saw out of scraps laying around the shop, but every once in a while there is a useful little gadget you can make.

One of the things I've always wanted to make was my own marking gauge. I kept toying with the idea, but there were two problems I couldn't find a solution for.

I knew I could make the arm and the body out of wood — that's common practice and relatively easy to do. But I couldn't figure out a cheap and easy way to hold the arm securely in place after it was set. This is usually done with a fancy brass thumb screw that goes through a threaded hole in the wooden body. (There are tools for threading wood, but they're not cheap.)

When I discovered rosan inserts (sometimes called threaded inserts), it solved the problem. All I had to do was screw the rosan insert into the body and use a regular old thumb screw to hold the arm in place.

But the thumb screw dented the wood, leaving little holes along the arm that caused problems. So, next I needed a fancy brass shoe like on the 'store-bought' marking gauges. Since I didn't have one of these either, I had to improvise. I dug deep in my pocket and came out with a penny. And that was the answer for my penny-pinching marking gauge. (On the deluxe model I use a dime.)

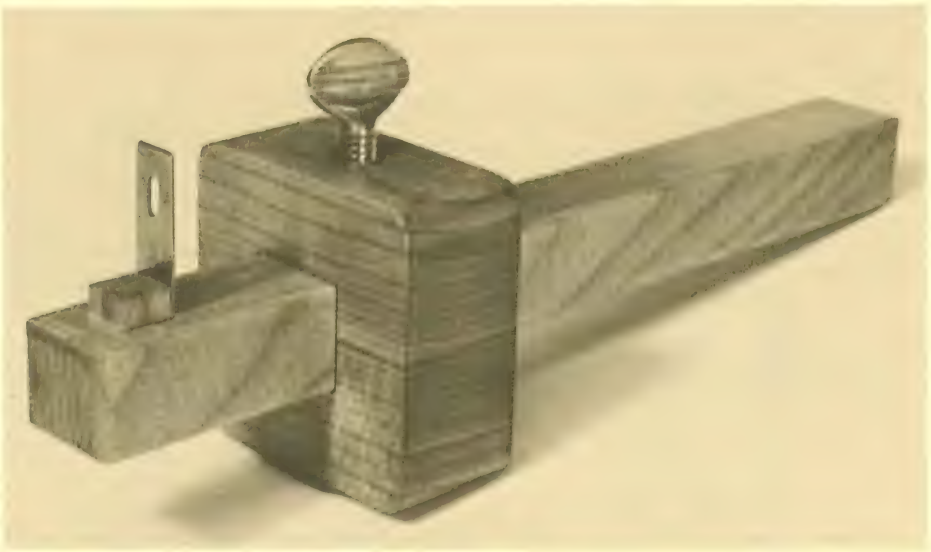
Getting this all put together is shown in the drawings at right. Since I had to counterbore a hole for the shoe (penny), I made the body by cutting a dado in some ¾ stock (the one shown is made of cherry).

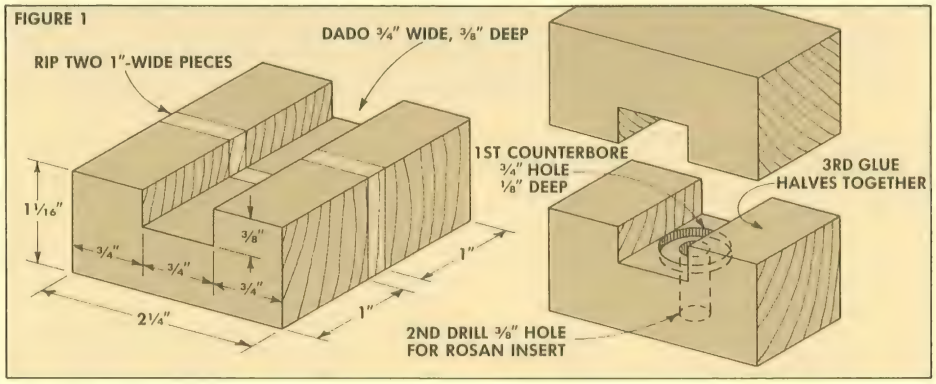
After getting the two halves (Fig. 1), I drilled a ¾" hole ⅛" deep (for the penny), and followed with a ⅜" hole for the rosan insert. Then I glued the two halves together so the dadoes formed a mortise.

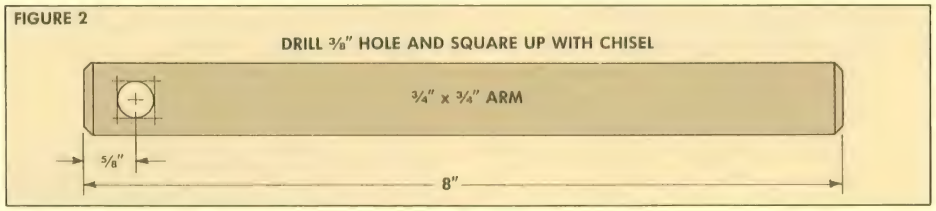
Next I ripped a piece for the arm so it fit snugly in the mortise, Fig. 2. Since I didn't have a fancy steel pin for the marking point, I used an *X-acto* blade. To mount it I had to mortise a hole near the end of the arm. I just drilled a ⅜" hole and squared it up with a chisel.

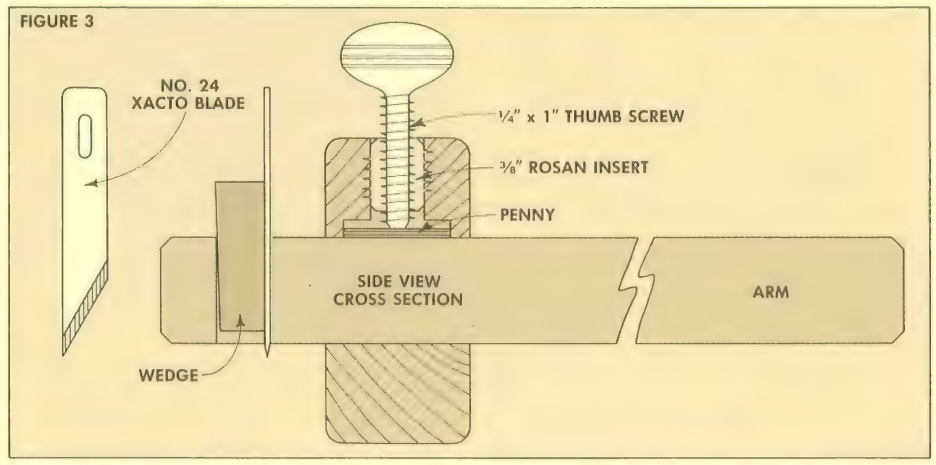
Finally, I carved out a small wedge to fit the mortise. It's a little hassle getting the *X-acto* blade set to the proper depth with the wedge. But once it's in there the blade does an excellent job of marking a nice crisp line. (And it's easily replaced when it gets dull.)

So that's it. My little penny-pincher marking gauge.









Three Drawer Coffee Table

DRAWERS WITH NO VISIBLE MEANS OF SUPPORT

I think this is a project that might appeal to a lot of woodworkers. I'll admit the design is quite simple. But simple designs often require quite a bit of ingenuity in the shop. That was definitely true with this Coffee Table.

The entire table (including the drawers) is assembled with only one basic joint: through dovetails. Every one of these joints must be cut by hand, and they're clearly visible once the table is assembled. If you blow a cut, it's going to show.

And then there's the drawers. If you were to crawl under this coffee table (a favorite pastime of woodworkers), you'd see nothing but the bottoms of the drawers. No rails, no drawer guides, no visible means of support. Just three drawers hanging in mid-air. But before we get to the drawers, the basic table must be assembled.

THE TOP AND LEGS

The table consists of three slabs of wood for the top and two legs (sides). Each slab is glued up from ¾ oak (¾ hardwood is 1$\frac{1}{16}$" thick actual). As shown in the Cutting Diagram, I started out with four boards 5½" wide and 8' long.

Before cutting the boards into the three sections for the three slabs, I marked each section so I could keep them in order. Then I cut off each section to rough length, and ripped a clean edge on both edges (trimming the width down to about 5¼" wide). The rough dimensions for the legs are 21"w x 20"l, and for the top: 21"w x 52"l, Fig. 1.

To glue up the slabs, I started with the legs because the pins of the dovetails would be cut in them first. After arranging the sections in the same order for each slab, I applied glue to the edges and clamped them together with pipe clamps — no dowels or splines were used. When the glue was dry, I hand-planed the slabs smooth, making sure the end of each slab was a uniform thickness from edge to edge. (See *Woodsmith* Number 15 for more on this method.)

Now all three slabs can be ripped to a final width of 20½". One end of each slab for the legs is cut off square — leaving the other end rough and a little long for now. Both ends of the slab for the top are cut off square, to a final length of 51".

SHOP NOTE. To get a good clean edge, I used a circular saw (Skil saw) with a hollow-ground planer blade to make the cut. Also, I clamped a fence to the slab to guide the shoe of the circular saw.

THE DOVETAILS

The top and legs are joined with through dovetails. The worst part about cutting these dovetails is finding a way to clamp these rather large and heavy slabs in place to make the cuts. I wound up clamping them to the workbench with pipe clamps.

The actual cutting is just like any other dovetail, except there's a little problem with vibration because the slab is so wide. I might add that it took almost a full day just to cut and chop them out — mostly because I didn't want to blow a cut.

THE PINS. To start, the pins are marked out on the legs. Each of the pins is the same size. Looking at the outside face of the legs, the narrowest part of each pin is ½" wide, Fig. 2. To mark the angles on the end grain I used a setting of 1:5 (10°).

However, the spaces between the pins varies, increasing from 2¼" on the outside edges to 4" in the center. This spacing adds a rather nice custom-made look to the finished joint.

THE TAILS. Once the pins are cut and chopped out, they are placed on the end of the slab for the top, and the cut lines for the tails are marked. Then it's just a matter of cutting and chopping out the waste sec-

tions as with any dovetail.

FITTING. The three slabs can now be dry-assembled (a somewhat frightening event). As the tails are pounded home, watch for any signs of splitting in the legs or top.

If everything goes well you can go ahead and trim the bottom edge of the legs square and glue up the table. If there are massive problems, there should be enough wood left on the legs to cut new pins, and the top will just have to be trimmed down a bit for new tails.

THE DRAWERS

If I may be permitted a little pat on the back, I think the mounting system for the drawers is kind of clever. Actually, the system we came up with was mostly the result of one problem leading to another.

The first problem we faced was how to support the drawers from the top (instead of from the bottom, or the middle of the sides, as is typical). The solution was to cut the drawers' sides extra-wide so they extended ½" above what would normally be the top edge. This allowed room for a groove along the top edge so we could hang the drawers from overhead guide bars.

THE DRAWER FRONTS. After coming up with this mounting system, the first step was to cut the pieces for the drawer fronts and backs. The three drawer fronts should be laid out on one board and cut so there's a continuous grain pattern across the three fronts, Fig. 3. (The same goes for the drawer backs because they're visible from the other side of the table.)

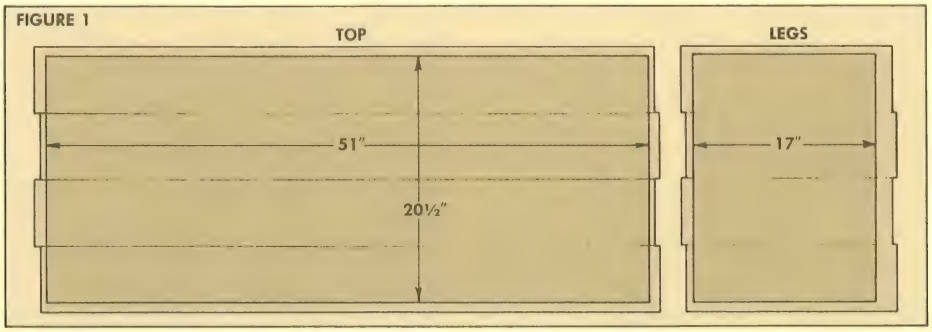
The drawer fronts and backs are 3½" wide. The final length of these pieces is taken from the assembled table. First measure the distance between the legs (it should be 49") and subtract 1". (The 1" allows for the two ½" gaps between the outside drawers and the legs, see Fig. 3). Now divide the remainder by 3 to get the final length of each drawer. (I came up with a length of 16" for each piece.)

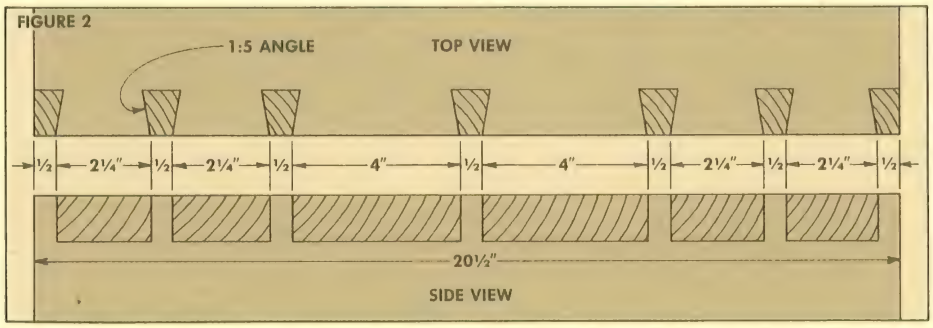
THE SIDES. The drawer sides are cut 4" wide (½"wider than the fronts and backs). The final length of the sides is 19½" (1" less than the width of the table). This means the drawers will be recessed ½" from both the front edge and back edge of the table.

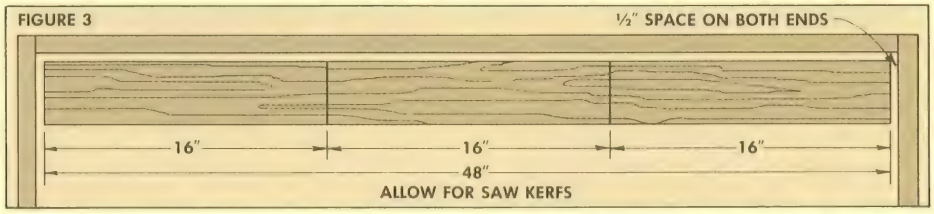
THE DOVETAILS. Now the drawers can be assembled with through dovetails. If you managed to cut the dovetails on those slabs for the table, the drawers are no sweat.

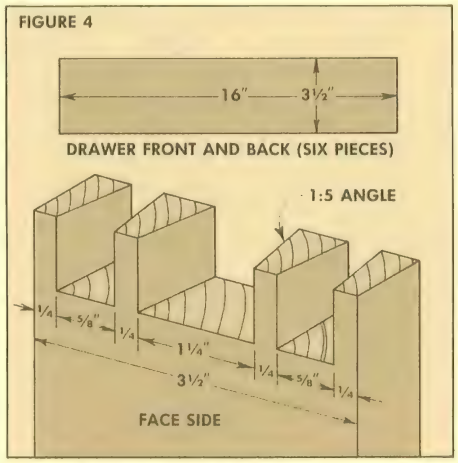
Since all three drawers are exactly the same, and since I wanted to maintain the continuous grain patterns on the drawer fronts and backs, I clearly marked every piece to keep things organized.

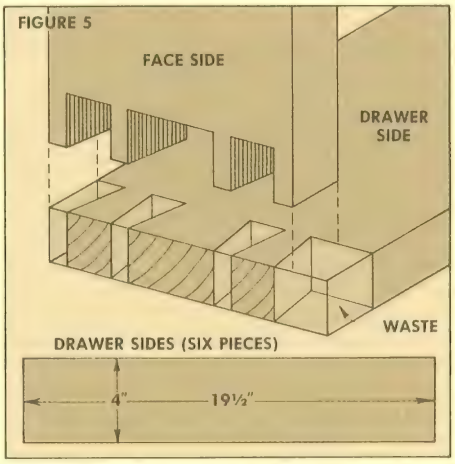
Then I marked and cut the pins on the drawer fronts and backs, Fig. 4. When marking the tails (Fig. 5) be sure to leave the extra ½" width on the top edge of the drawer sides, Fig. 6.

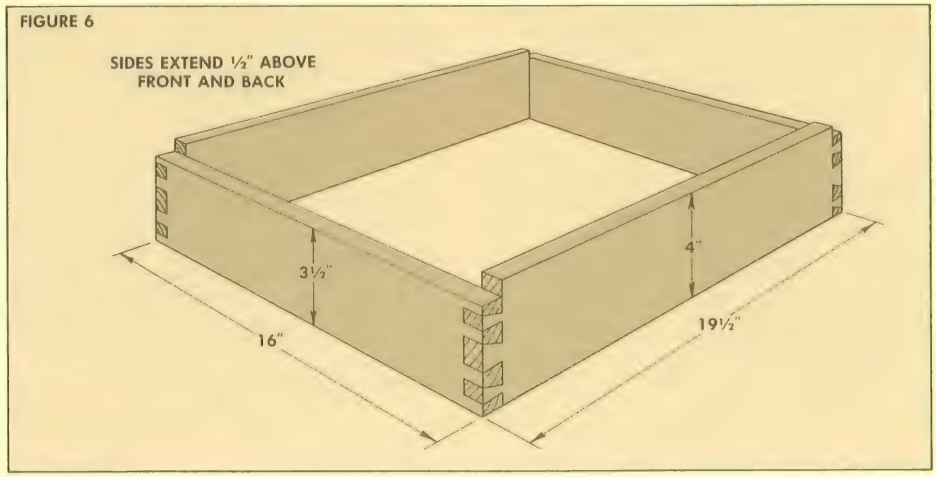


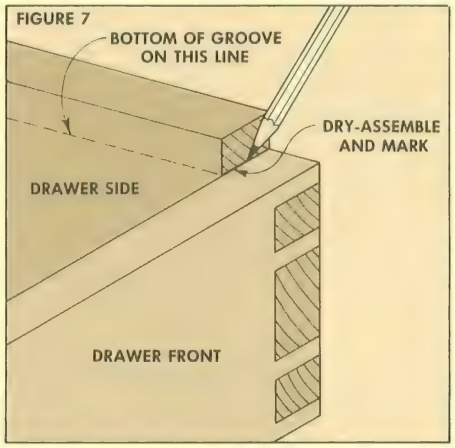


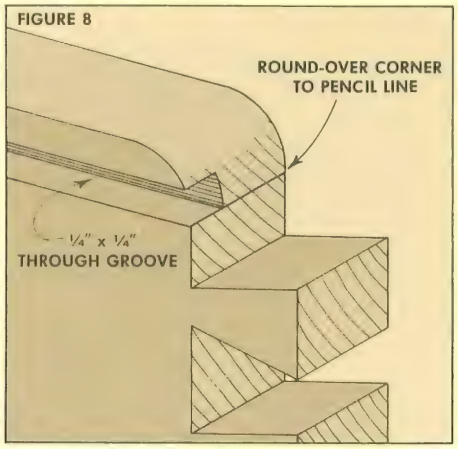


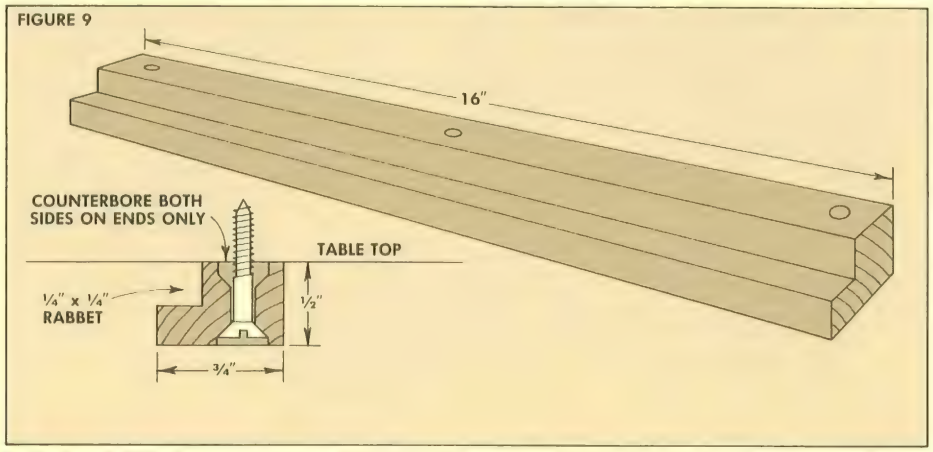


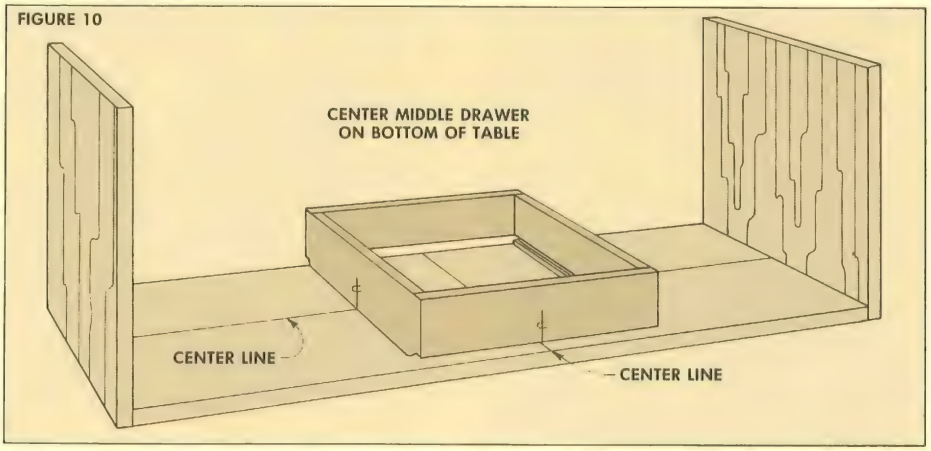


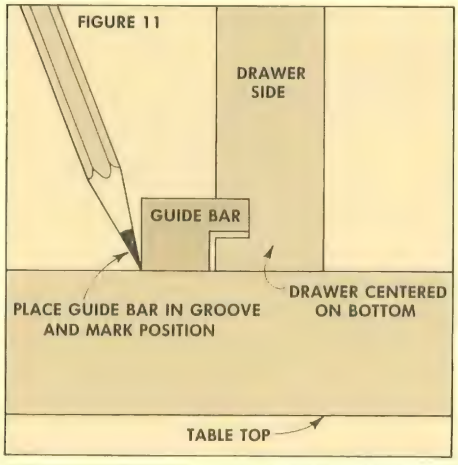


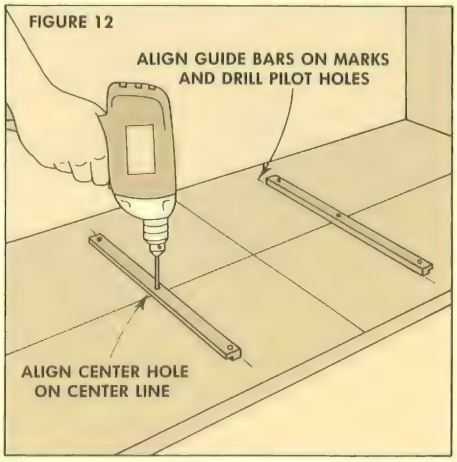












After the dovetails are cut, dry-assemble each drawer. Now the position of the groove for the guide bars can be marked. We wanted to mount the drawers side by side with no gap between them. To accomplish this we had to mount the drawer guides on the *inside* face of the drawer's sides. Which, in turn, meant the grooves for the drawer guides also had to be cut on the inside of the drawer.

To mark the position of the groove, mark the front edge as shown in Fig. 7. Then disassemble the drawer and use this mark to cut the ¼"-wide groove. Finally, round-over the corner on both ends, Fig. 8.

Now the four pieces for the drawers can be glued up, but they must be square. I cut a piece of plywood to the inside dimensions of the drawers and placed it inside the drawers as they were clamped together to hold them square.

Normally, the drawer bottom would be cut and mounted at this point. But, in order to mount the drawer guide bars you have to have access through the drawer, so the drawer bottoms are installed later.

DRAWER GUIDE SYSTEM

The drawers are mounted to the table with rabbeted guide bars, Fig. 9. Making these bars is pretty easy. Mounting them takes some patience. I cut the six bars from Maple stock. A rabbet is cut on one edge, leaving a tongue that mates with the groove in the drawer sides. This tongue should be just a hair smaller (both in thickness and length) than the grooves in the drawers.

Since the bars are mounted across the grain of the top, there will be problems as the top expands and contracts with seasonal changes in humidity. To allow for this movement, counterbore a pilot hole on one side of the bars to accept the screws. Then, another counterbore is drilled on the other side to allow the screw to move (bend) as the top moves. (See Fig. 9.)

To mark the position of the bars, it's easier to work upside down (the table, not you). Flip the table over and mark both center lines on the bottom of the table, Fig. 10. Also mark the four center points on the middle drawer.

Now slide one of the guide bars into the groove, and mark its position, Fig. 11. Remove the drawer and hold the guide bar in position to drill pilot holes into the table, Fig. 12. Go ahead and screw this bar in place (screw only, no glue). Reposition the drawer on this guide bar and insert the second bar. Once again, mark its position, remove the drawer, and screw this bar in place (allowing a little bit of clearance so the drawer slides easily).

With the middle drawer in position, place the other two drawers tight against it. (They should be tight for now, clearance will be taken care of later.) Mark the posi-

tion of the guide bars for these two drawers, and screw them in place, Fig. 13.

Each drawer should move easily along the guide bars, but they will probably rub against each other. If the drawers bind on the guide bars, plane or sand down the tongue a little bit. If they still bind, you may have to realign the guide bars.

To allow clearance between the middle drawer and the two outside drawers, plane or sand a slight hollow on the sides of each drawer. As shown in Fig. 14. The hollow allows the drawers to move freely as they're opened, but leaves the front and back fairly tight when they're closed.

DRAWERS, BOTTOMS AND CATCHES

Now the drawer bottoms can be installed. To mount the bottoms, a rabbet is routed on the bottom four edges of the drawer. This rabbet is ¾" deep to allow for the ¼" plywood bottom, plus ½" as a lip to pull the drawer open. (Drawer pulls on the drawer fronts would look kind of clumsy, and would destroy the nice flow of the grain pattern from drawer to drawer.)

I cut this rabbet on a router table with a rabbet bit and pilot, Fig. 15. After routing the rabbet, the corners must be chopped square with a chisel.

The drawer bottom is cut from ¼" oak plywood and glued into the rabbet. (Triangular glue blocks can be added for more support.)

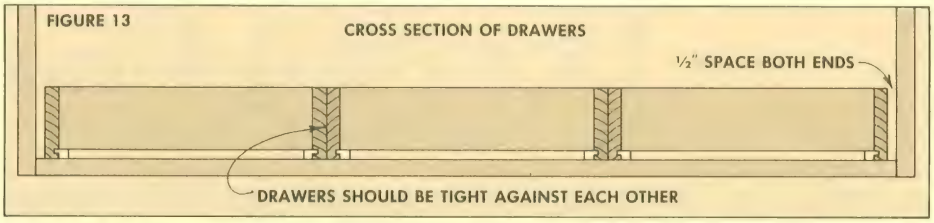
THE STOPS. We thought it would be a nice touch if the drawers opened from the front or the back of the coffee table. Getting them to open from either direction was no problem. But as they were closed, getting them to stop so they lined up (without a lot of fumbling around each time) meant there had to be stops of some sort. This was a problem.

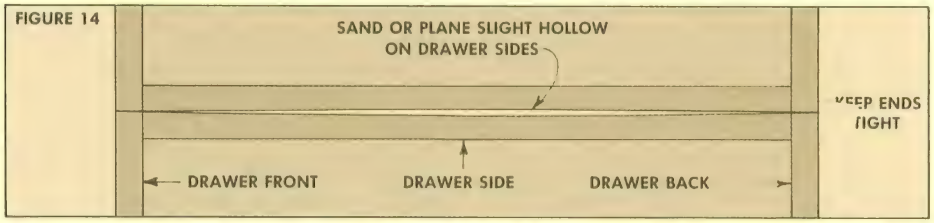
We finally figured out a way to use bullet catches. As shown in Fig. 16, these catches look just like bullets with a hollow 'shell' and a spring-loaded 'bullet'. These catches usually come with a one-way striker plate (a dish-like plate with a channel for the bullet). Since the striker plates only work one way (and we needed two-way action), we had to improvise.

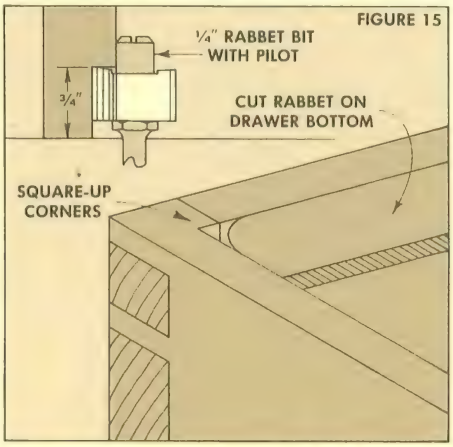
A small hole was drilled on the top center of one side of each drawer. This was done with a 5/16" twist bit to get a slight inverse-cone shape. Then, the bullet catches were mounted in holes drilled along the center line of the bottom of the table, Fig. 17.

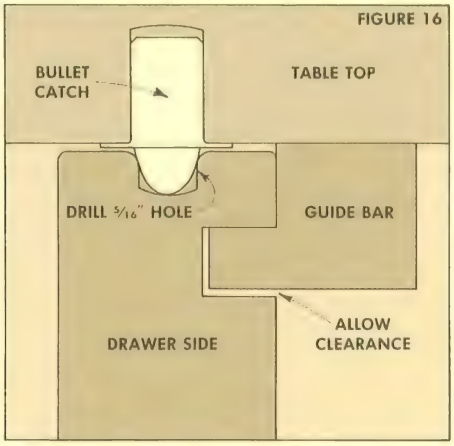
As the drawer is opened, a slight tug is required to get the spring-loaded bullet out of the hole. Then the bullet rides along the top edge of the drawer side. When the drawer is closed, the bullet pops into the hole. This is not a sure catch (you hear it more than feel it), but it works very nicely.

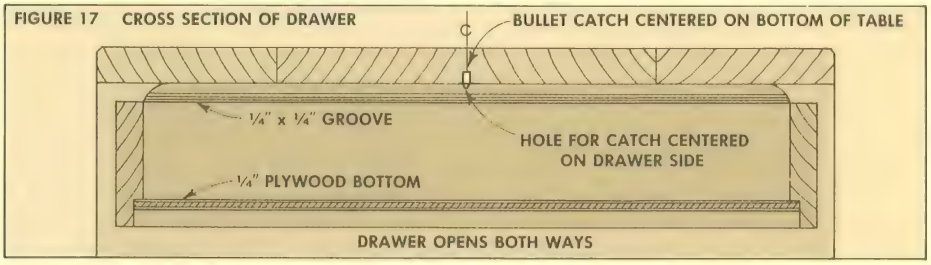
Bullet catches should be available at better hardware stores. One mail-order source for bullet catches is: *The Woodworker's Store* Catalog, 21801 Industrial Blvd., Rogers MN 55374.











FINISHING

This table was finished with *Watco* oil. The technique I used is to apply a liberal coat of oil and, while the oil is still wet, sand the surface of the table with 220-grit silicon-carbide paper. This creates a goopy mess of oil and sawdust that fills the pores of the oak (and any voids in the dovetails).

Keep adding oil and sanding until all the pores are filled. Wipe off the excess and let the oil dry for a day or so. Then add another coat of oil (this time without sanding). The result is a smooth, natural finish that feels as soft as a baby's bottom.

Finally, apply a coat of furniture wax (I used *Watco* Satin liquid wax) to the table. Also, put a coat of wax (I used car paste wax) on the drawer guides so the drawers slide easily.

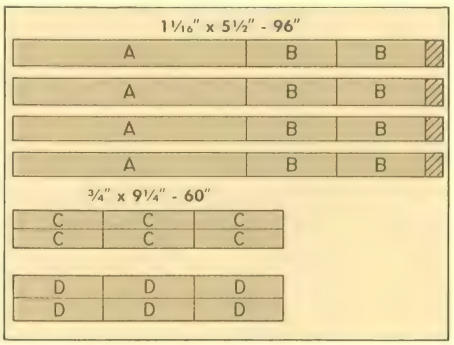
MATERIALS LIST

Overall Dimensions: 17"h x 20½"w x 51"l

A	Top (4 pcs)	1 1/16 x 5¼ - 52
B	Legs (8 pcs)	1 1/16 x 5¼ - 16
C	Drawer Fronts (6 pcs)	13/16 x 3½ - 16
D	Drawer Sides (6 pcs)	13/16 x 4 - 19½

Drawer Btms. cut to fit from 24x48 plywood

CUTTING DIAGRAM



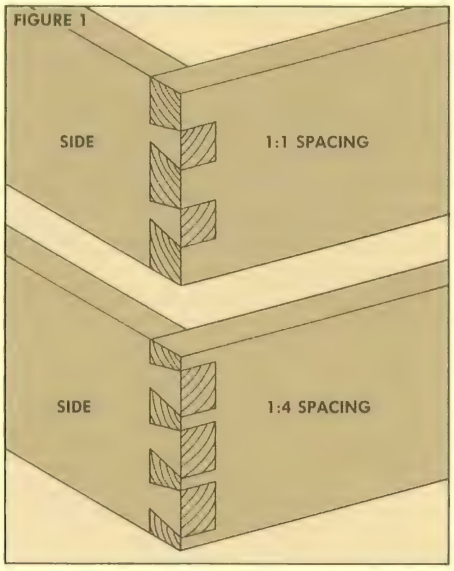
Dovetail Drawers

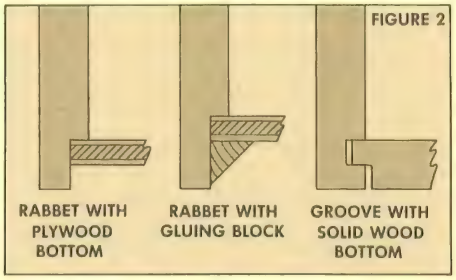
SPECIAL CONSIDERATIONS

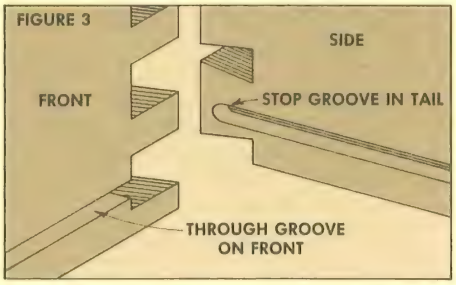
In times past craftsmen demonstrated their skill by concealing all signs of joinery. Drawer fronts, for example, were joined with half-blind dovetails so the joint could not be seen (when the drawer was closed). Through dovetails were only used to join the drawer back to the sides.

But times have changed. Joinery has come out in the open. Today, through dovetails are used on drawer fronts to show off this handsome joint, and add a spot of subtle decoration. However, when through dovetails are used on drawers there are some special considerations . . . and some problems.

LAYOUT. The layout (size and spacing of the pins and tails) should be done with care. If the pins and tails are equal width, the dovetail joint will look just like a box joint (from the front of the drawer), see Fig. 1. However, if the joint is laid out so the relationship between the pins and tails is about 1:4 or 1:5, the joint takes on much more of a custom look.







DRAWER BOTTOM

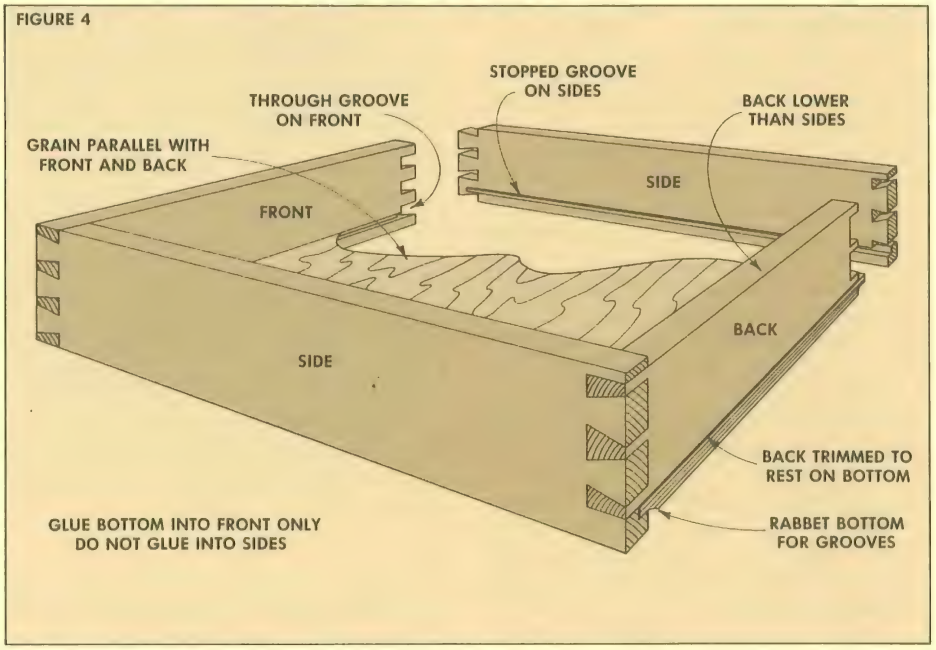
So now the joint is nicely proportioned, but you still have to get the drawer bottom in there some way. There are two basic options for mounting the drawer bottom, see Fig. 2. The easiest way is to go ahead and cut the dovetails on all four pieces and assemble them. Then to insert the bottom, a rabbet is cut around the perimeter of the bottom edge of the drawer and the bottom is glued into the rabbet. (A plywood bottom must be used with this method.)

On large drawers that will have to bear a lot of weight, it's helpful to cut the rabbet about ¼" deeper than the thickness of the bottom. Then triangular glue blocks can be cut and glued to the plywood bottom and the drawer sides.

STOPPED GROOVES. Another option is to cut grooves in the front and the two sides for a plywood bottom. The groove on the drawer front can be cut from one end to the other providing it doesn't slice through the half-pin, Fig. 3.

The groove on the sides must be stopped. If the groove were cut all the way through, it would slice off part of the tail and there would be an unsightly gap showing right on the front of the drawer.

The easiest way to cut a stopped groove is on a router table (see *Woodsmith* No. 5). Although cutting a stopped groove is kind of a hassle, there is an advantage to this method. The plywood bottom can be inserted as the drawer is glued together to help pull the drawer square.



SOLID WOOD BOTTOM

Since dovetails are usually reserved for drawers (and furniture) of rather high quality, you may want to make a solid wood bottom (instead of using plywood). The problem with solid wood is that it's going to move (expand/contract with seasonal changes in humidity). If a solid wood bottom were glued into a rabbet, it wouldn't be free to move, and sooner or later it would split. So, it must be mounted with the stopped groove method.

The solid wood bottom can be glued up of slightly thicker wood than the groove. Then the edges are chamfered (just like a raised-panel in a door), or rabbeted to form a tongue to fit the groove.

The primary consideration, however, is the direction of the grain, Fig. 4. The grain must run across the width of the drawer. That is, so the end grain is mounted in the drawer sides.

The front edge of the bottom can be glued into the groove in the drawer front to hold it in place. However, the edges in the drawer sides must be free to move (no glue is used). Also, the back should be trimmed so it rests on top of the solid wood bottom. This allows the wood to move freely.

Serving Tray

IT'S REALLY A DRAWER WITHOUT A HOME

This project was designed to incorporate all the problems of building a drawer joined with through dovetails. But instead of having a drawer with nowhere to put it, you have a handy little serving tray. (Another option is to leave off the handles for an in/out box.)

The four sides of the tray are made of ½" solid oak, and the bottom is ¼" oak plywood. The nice thing about this tray is that it doesn't have to be any particular size. (Translated, that means if you blow a cut, you can always trim it off and start again.)

To make the tray, rip the two pieces for the ends to a width of 3½", and the two long sides are ripped to a width of 2¾". Then leave the saw at the 2¾" setting and make a partial rip cut (about 1" long) into the top edge of the end pieces, see Fig. 1. Clip off this little piece of waste so the ends of the boards are the same width.

THE DOVETAILS. The size and spacing of the pins and tails for the dovetails is shown in Fig. 1. If you choose a different spacing, be sure the half-pin on the bottom is fairly small so the groove for the bottom clears this half-pin.

To cut the dovetails, I started with the pins on the long sides. Once these were cut, I used them as a template to lay out the cuts for the tails.

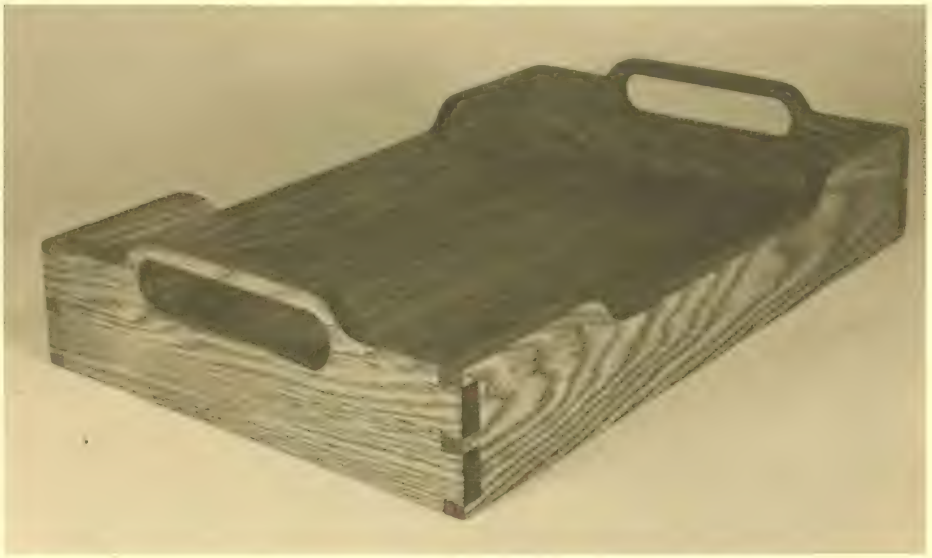
GROOVES FOR BOTTOM. After the dovetails were cut, I cut the grooves for the ¼" plywood bottom. The grooves on the long sides can go all the way from one end to the other. However, the grooves on the end pieces must be stopped, Fig. 2. I cut these grooves on a router table.

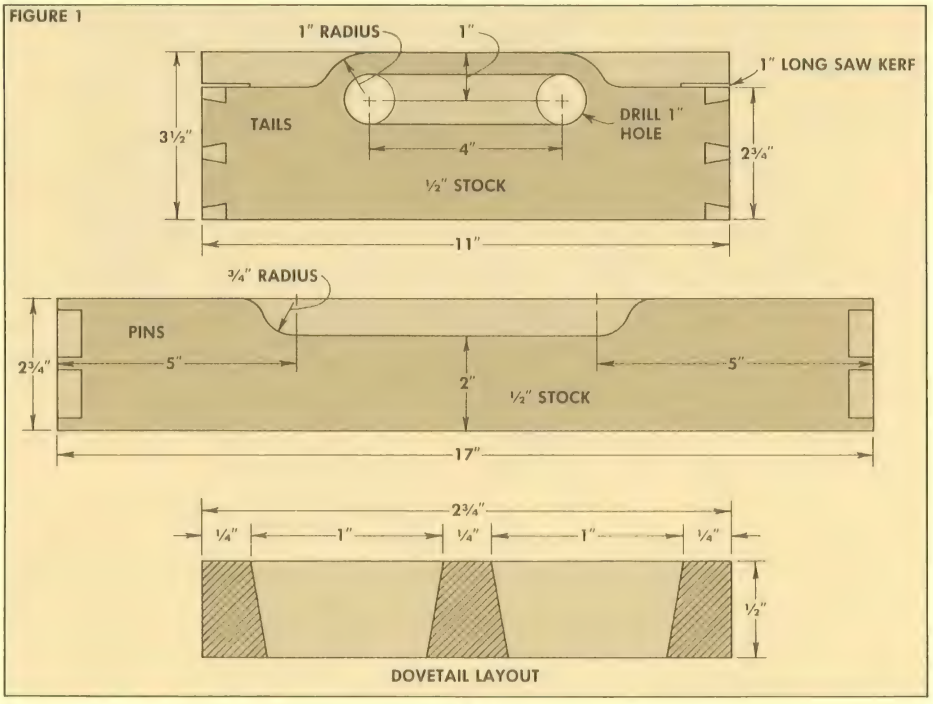
After the grooves are cut, dry-assemble the four sides and get the measurements for the plywood bottom. Cut the bottom to size and check its fit in the tray.

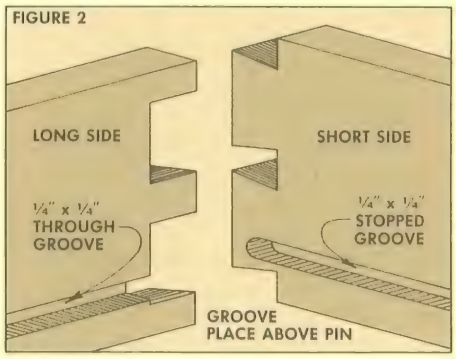
HANDLES. To cut out the handles, I used a Forstner bit to drill two 1" holes, and cleaned out the waste between the holes with a sabre saw. The edges inside the handle are rounded over with a ¼" corner round bit on a router. (If you want to make an in/out box instead of a tray, leave off the handles and cut S-curve recesses as on the long sides.)

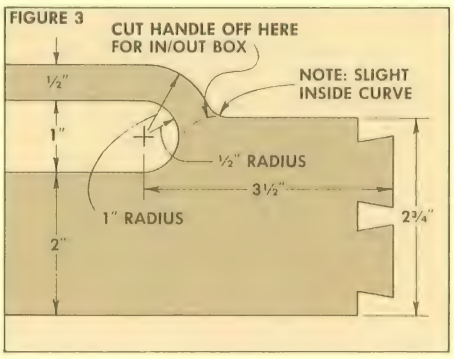
The S-curve recesses on the long sides are made by first drilling ¾" holes, centered on the top edge. Then the waste between the holes is removed with a sabre saw and the top corners are rounded over to finish out the S-curve.

FINISHING. I glued and clamped the tray together and sanded the corners smooth. Then I finished it with *Watco* oil, as described in Shop Notes, page 12.









Shaker Step Stand

GETTING TWO STEPS AHEAD WITH DOVETAILS

Shaker furniture is famous for its basic, uncluttered style, as well as its unquestioned utility. The Step Stand shown here is a classic example of Shaker design at its best. It's simple furniture that works. The only decoration (if it can be called that) is the beauty of the wood and the dovetail joints.

If I were just learning to cut dovetails, I think this is a project I'd want to tackle. However, there's a lot of preparatory work involved before you get to the fun part. One of the biggest headaches is thinking through the sequence of work.

GETTING STARTED

This first step is to select the wood to be used. Although this sounds trivial, the grain patterns of the wood play an important role in both the ease of getting the work done, and the final appearance of the Step Stand. I chose cherry for this project mostly because it's an excellent wood to work with hand tools.

If you can get nice straight boards that are 7" wide (and not cupped), the job will be somewhat easier. However, we're showing narrower boards in the Cutting Diagram to give an idea of how to layout the cuts if you must glue-up boards to get the 7" width necessary.

Since cherry can vary so much in color (from dark blood red to a very light pink), matching the pieces to be glued up should be done with care. (As you can see in the photo, my ability to match boards leaves something to be desired.)

THE CUTTING DIAGRAM

I started by laying out the cuts to make two steps and four legs. For the time being, I considered the legs four separate pieces (two short legs for the front and two long legs for the back). Later, one short and one long leg would be joined together later to form the final 'stair-step' legs.

THE CUTTING DIAGRAM. The Cutting Diagram shows how to lay out the cuts on 5½"-wide boards. Basically, I cut two pieces for each leg: one piece 5" wide and another 2½" wide. These two pieces are edge-glued together (no dowels or splines) to get the 7½" rough width, Fig. 1.

After the glue was dry, I planed these boards smooth. The hard part is making sure the boards are planed to an even thickness, especially at the ends of the boards (where the dovetails will be cut.)

After the boards are planed to final thickness, I cut off one end square with the edges (leaving the other end rough, and a little long for now). Then I ripped them down to the final width of 7".

THE LEGS

The next step is to lay out the cuts for the dovetails in the legs and steps. To determine which piece gets the tails and which gets the pins, two things must be taken into consideration.

The joint should be laid out so the tails are on the steps. Since the tails can be made fairly wide, they will be strong enough to support the weight of anyone stepping on the Stand.

This means, of course, the pins must be on the legs, which works out just fine because the locking characteristics of the pins will prevent the Step Stand from 'racking.'

The layout I finally settled on for the size and placement of the pins and tails is shown in Fig. 2. There are enough tails and pins to make a fairly sturdy joint. Also the tails are about 5 times wider than the pins to provide the strength needed on the steps.

However, there is one more thing to allow for. Even though the total width of each board is 7" to start, the dovetails are laid out across a width of only 6¼". The extra ¾" on the front edge of each board allows for the thickness of the brace (which is added later).

THE PINS. The pins are laid out so the narrowest part of each pin is on the OUT side of each leg. Then the bevel gauge is set to a 1:5 angle to mark the angles on the end of the board.

We've shown the width of each pin as exactly ¼", and the spaces between the pins as exactly 1¼" (see Fig. 2). When you add up these figures you get the 6¼" needed. However, slight alterations should be made. If the narrowest part of the pins is just a smidgen over ¼", it's much easier to get a ¼" chisel in there to

clean out the waste on the tails. This, of course, reduces the width of the spaces between the pins to just under 1¼". This is no big deal, it just helps when the actual cutting begins.

After marking the cut lines, the pins are cut and chopped out as with any other dovetail joint . . . except, the half pin on the front edge of each piece is left extra-wide to allow for the notch for the brace, see Fig. 2.

GLUE-UP LEGS. Before marking the cut lines for the tails, I glued one short and one long leg together to form the final version of the stair-step legs, Fig. 3. Then I planed this assembly smooth, making sure all of the pins were still an even thickness.

Although this makes marking the cut line for the tails a rather awkward procedure (as shown in Fig. 4), there is a reason. If you glue the long and short legs together first, you can plane this leg assembly smooth — evening out any variation at the glue-joint line. Since you'll have to plane the whole surface, the thickness of the pins will be altered. This is okay because now the tails can now be marked to final (actual) thickness of the pins.

On the other hand, if you mark the cut lines for the tails before gluing up the two legs, you could run into problems. You would have to be very accurate when the two leg sections are glued together. If the joint line is off and you try to plane it smooth, the pins will be shaved down and the dovetails won't fit properly.

THE STEPS

After the legs are glued up, the boards for the steps can be cut to the 15" final length, making sure the ends are square with the edges. The final width of the steps is 6¼". However, I glued them up to width of 7½" to start. Then, trimming them down to size was done in two stages. First I trimmed them to a 7" width to match the width of the legs. But I waited for final trimming until the notches for the braces were cut so I could get an exact fit.

The cut lines for the tails can now be marked on the steps using the pins on the legs, Fig. 4. When marking, make sure the steps are lined up with the back edge of the legs (any extra width should hang over the front edge where it's easy to trim off).

FINAL FITTING. Once the pins and tails are cut, go ahead and tap the joints together (the moment of truth). The joints should be tight, and the assembled Step Stand should be square. If there are massive problems, clean up the pins as best you can and you'll probably have to cut new boards for the steps.

Once everything fits, the bottom of the legs can be cut off square (I did this on a table saw with the panel cutting jig shown in *Woodsmith* No. 18.) Finally, the 4½" radius half-circle can be cut on the bottom of each leg.

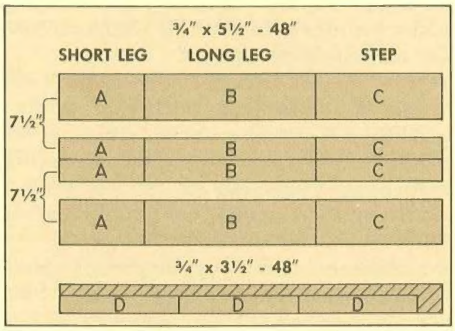
MATERIALS LIST

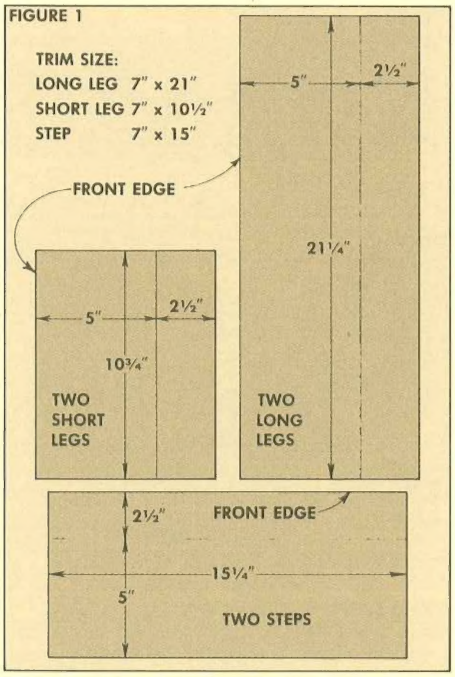
Overall Dimensions: 21"h x 15"w x 14"d

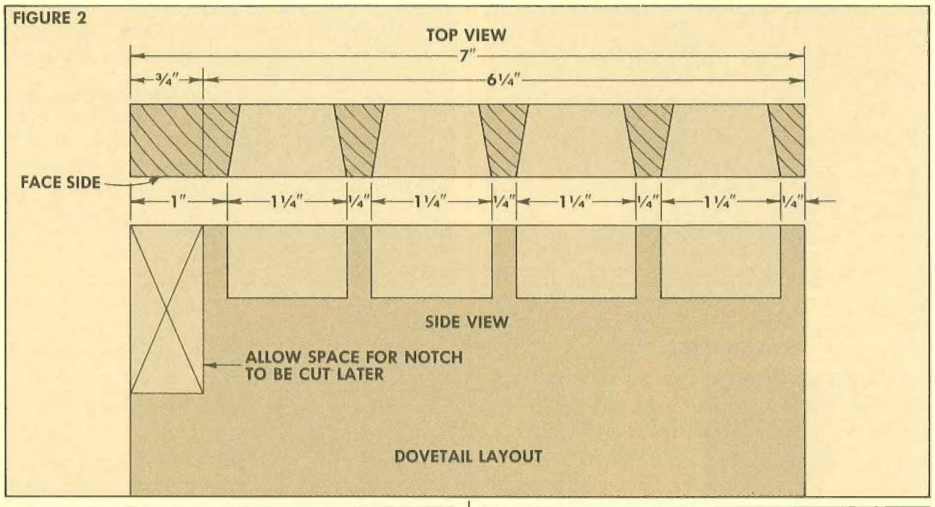
A	Short Leg (2)	¾ x 7 - 10½	(7½ x 10¾)
B	Long Leg (2)	¾ x 7 - 21	(7½ x 21¼)
C	Step (2)	¾ x 7 - 15	(7½ x 15¼)
D	Braces (3)	¾ x 2 - 15	(2¼ x 15¼)

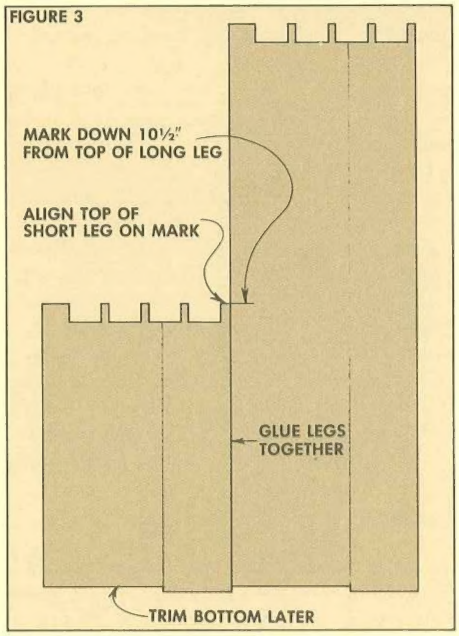
Figures in parentheses are rough dimensions.

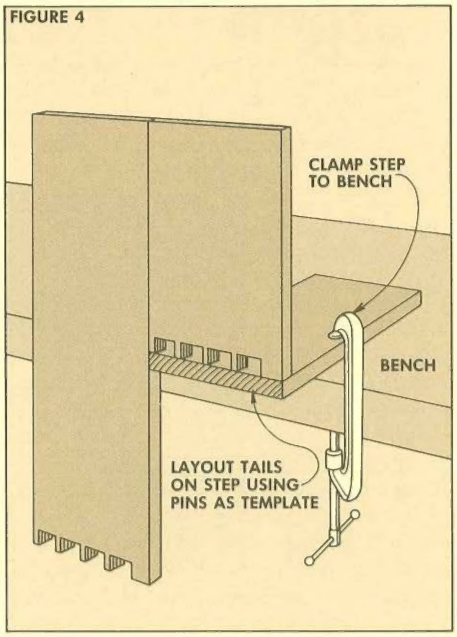
CUTTING DIAGRAM

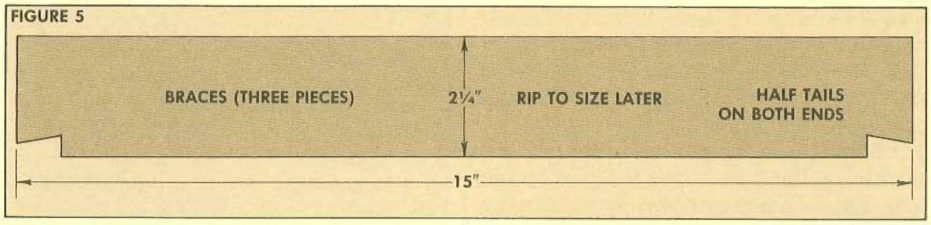


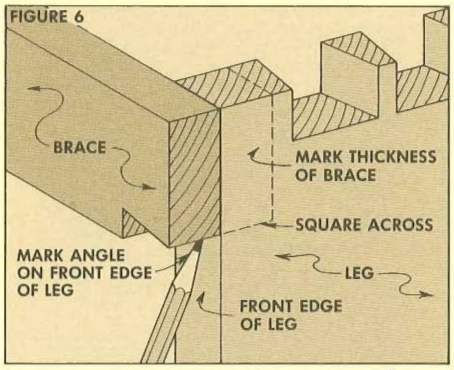


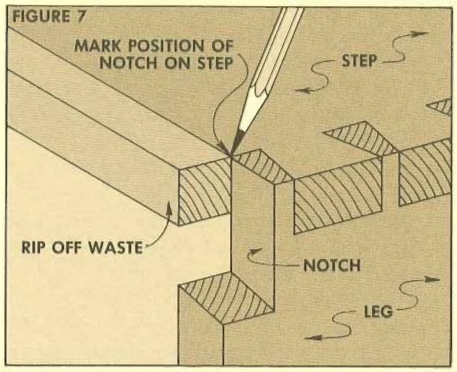


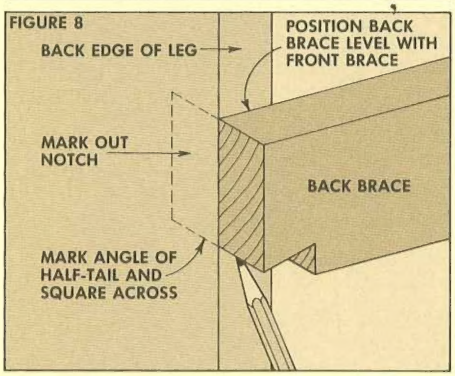


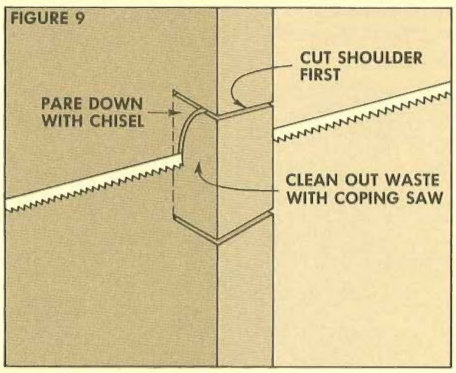


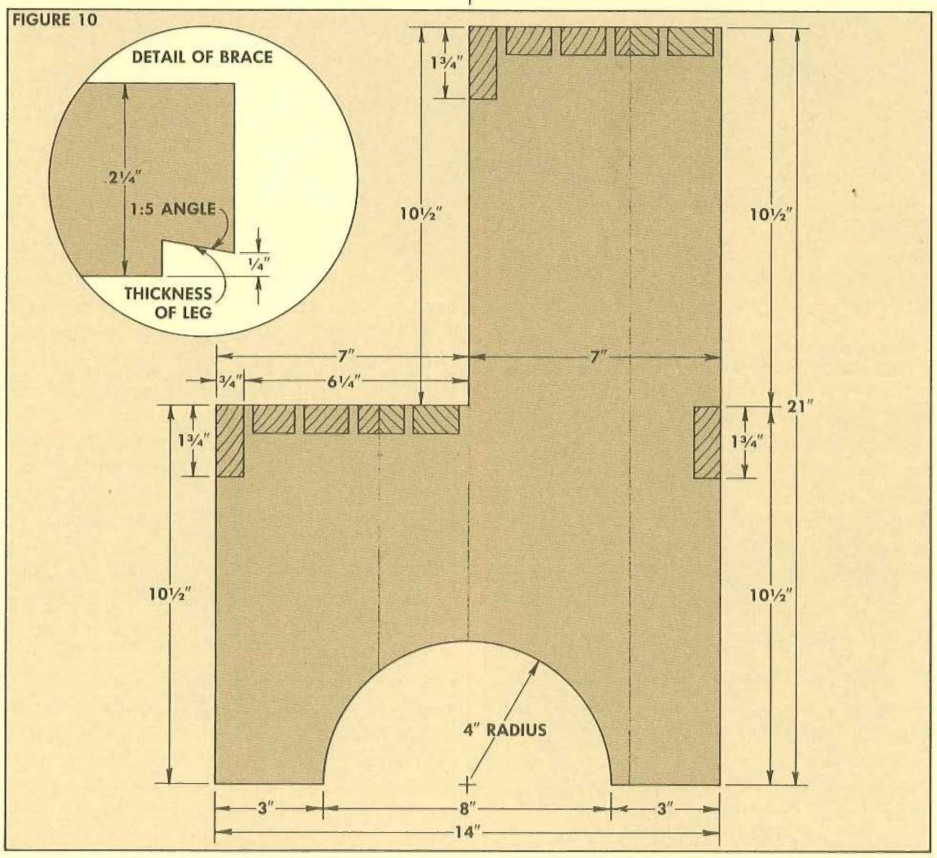












THE BRACES

Before gluing the legs and steps together, the braces must be cut. There are three braces: one on the back to help keep the Stand sturdy (prevent racking), and two braces on the front to reinforce the strength of the steps themselves (to take the brunt of the weight when someone steps on them).

All three braces are joined to the legs with a half-dovetail joint. This amounts to a large half-pin notch in the legs, and a matching half-tail on the ends of the braces. I found it easiest to cut the half-tail on the brace first, and used it to mark the cut lines for the notches.

HALF-TAIL. To cut the half-tail, use a sliding bevel to mark a 1:5 angle on only one end of each brace. This line starts ¼" up the bottom edge (see Detail in Fig. 10.). Then mark a shoulder line equal to the thickness of the leg. Saw down the shoulder line with a dovetail saw, and pare out the V-shaped notch with a wide chisel.

Before marking the shoulder line on the other end of each brace, make sure the shoulder to shoulder distance is equal to the measurement between the legs, Fig. 5. Then mark the angle and pare out the V-notch.

THE HALF-PINS. Once the half-tails are cut on the braces, hold the end of the brace on the front legs to mark the cut line for the half-pin notches, Fig. 6. I used a dovetail saw to saw down both cut lines. Then I cleaned up the saw marks with a paring chisel (using it just like a hand-held plane).

The half-pin notch on the back is more of a problem. After marking the cut lines (so they're even with the front brace, Fig. 8), I made the two shoulder cuts to the depth of the notch. Then I removed most of the waste with a coping saw, and cleaned up the cut with a chisel, Fig. 9.

GLUE-UP AND FINISHING

The front edges of the steps can be trimmed to final width, Fig. 7. Then dry-assemble the Stand to make sure everything fits. Clamping these pieces together is kind of a hassle because of the half-circle at the bottom of the legs. I applied some glue to the joints and tapped them together. Then I pulled the tails in place with pipe clamps. (Use a piece of scrap under the legs to support the clamps across the half-circle cut-out.)

Now it's just a matter of filing the ends of the dovetails flush with the surface. (Although it was nice to use hand tools for most of this project, I cheated and used a belt sander to smooth out the end grain.)

FINISHING. I wanted to go with an oil finish mostly because scuff marks would present a real problem on this kind of project. I finished the Step Stand with *Watco* oil, as described in Shop Notes, page 12.

Talking Shop

AN OPEN FORUM

SCOTCH GLUE

I've heard people mention using Scotch glue, but I haven't used it and really don't even know what it is. Do you know what Scotch glue is and where it can be purchased?

R. C. Skidmore
Hattiesburg, Mississippi

Scotch glue is another name for hide glue or animal glue. It's made from animal parts, usually the hides and bones.

Although hide glue is still available, it is not used very often any more since the introduction of the aliphatic resign (yellow glue) and polyvinyl acetate glues (white glue).

Liquid hide glue is available as both a liquid and a solid. The liquid form is ready to use from the bottle. The solid form must be soaked overnight in water and heated in a glue pot during use.

Hide glue, in both liquid and solid form, can be purchased from: Garrett Wade, 161 Avenue of the Americas, New York, NY 10013, 1-(800)-221-2942.

STORING HARDWOODS

I've recently started working with hardwoods and have built up a supply of about 100 board feet. My question is whether or not I'm storing it properly.

The boards are kept in my basement workshop laid on top of three concrete blocks with sticks between each layer of boards. I've been careful to assure that the tops of the concrete blocks all lie in the same plane. I am still concerned that this may not be the best method of storage.

If you have any suggestions, I would appreciate them.

William D. Turner
Brookfield, Wisconsin

Sticking lumber (placing sticks between layers) is a common practice used by the hardwood industry before kiln drying. To initially lower the percentage of moisture, the lumber is sticked and left to partially air dry. When the lumber is then placed in the kiln for drying, it is sticked again to help ensure even drying. After the lumber has been dried, it's then stacked in a solid bundle (without sticks).

If you stick lumber that has already been kiln dried, the lumber will constantly be trying to get its moisture content in equalibrium with the air in the room. Because most of the country has more humidity than 7-9% (the moisture content of kiln dried lumber), the lumber will be trying to absorb moisture.

If your lumber is kiln dried, I would stack it in a solid bundle with a piece of plywood under the bottom layer and another piece on top of the bundle. The plywood will help prevent moisture from entering the top and bottom layers.

Since the ends of the boards will absorb and release the most moisture, they should be protected with a product that contains a high solid content, like polyurethane.

When you are ready to use the lumber, I'd suggest you set it out on blocks like you suggested, for at least one week. This will allow the lumber to become somewhat adjusted to the humidity of the room without raising the moisture content to the point where the stability is reduced.

BALL BEARING SHAPER GUIDES

When cutting free-hand with the shaper, I have the problem of the wood burning on the guide. Do you know of any place they sell bearings to replace guides?

John Dwinnells
Stockton, Illinois

Freud U.S.A. *does offer ball bearing guides for shaper bits. In their catalog they list the ball bearing guides as ball bearing rub collars. These rub collars come in various sizes for both the inside and the outside diameters of the bearings. Unfortunately, the rub collars are not cheap. If you would like more information, please contact:* Freud U.S.A., 218 Feld Ave., High Point, NC 27264, 1-(800)-334-4107.

EARLY AMERICAN PINE

I am in complete agreement with you that the pine you used (*Woodsmith No. Eighteen*), short leaf yellow, is not a cabinet wood. It has all the faults you mentioned plus the fact that no matter how much you work on finishing it, you still end up with a wild pine grain. About the only thing you can do with it is to paint it.

However, most Early American furniture was made of eastern white pine or "punkin pine". It is easy to work with, has little grain, and is easily finished.

Name withheld by request

For the projects that we build with pine, we use ponderosa pine from the western U.S. Although ponderosa pine is easier to work with than short leaf yellow pine, it still presents problems in finishing (especially staining) when compared to hardwoods.

Unfortunately, the northern white pine (sometimes called eastern white pine) that was used in Early American furniture is only available in limited supply. Once consisting of stands equal to several hundred billion board feet, most of the trees that are standing now are second growth timber and equal only a fraction of the original board footage. When it can be obtained, it's usually knotty and small.

LOCATING SHEET ROCK SCREWS

In your last issue, Roger Urce wrote a letter in the tips and techniques page recommending the use of sheet rock screws. I'd sure like to know where he buys them because they seem to be unobtainable in our area.

Ted Frutkoff
Blue Ridge, Georgia

We assumed that most lumber yards that stocked sheet rock (dry wall) would also carry sheet rock screws. But after calling several yards in our area, we found that only a few yards stocked the screws. We were told that the distributors of sheet rock are usually the only firms that stock sheet rock screws. In our area, the distributors of sheet rock were found by looking in the Yellow Pages *of the phone book under* Dry Wall Contractors' Equipment and Supplies.

NON-TOXIC FINISH

I'm having a hard time finding an appropriate finish for beer steins turned on the lathe. Do you know of any non-toxic finishes that are safe to use on turned steins that are going to actually be used?

John P. Schantz
Allentown, Pennsylvania

Salad Bowl Finish, *made by* H. Behlen & Bro., *can be used on projects that will be in contact with food or drink. It contains only materials that have been approved for contact with food by the U. S. Food and Drug Commission.*

Seventy-two hours drying time is required before Salad Bowl Finish *is safe for use. The finish can be padded on which makes it useful for lathe projects. It can be purchased through:* Woodcraft, 210 Wood County Indust. Pk., P.O. Box 1686, Parkersburg, WV 26102-1686, 1-(800)-225-1153.

Tissue Box

NOTHING TO SNEEZE AT

It looks pretty easy. There are only a few dovetails on each corner and they're cut in stock that's only ½" thick. But this tissue box is nothing to sneeze at. If you want to test out your skill at cutting dovetails, this project might be a good place to start.

The thing that makes this little box difficult is that there's no room for error. Every dovetail is in plain sight and must be cut right on the money. Also, the basic box must be cut to a specific size.

THE BASIC BOX. To build the box, first cut the four sides to width and length as shown in Fig. 1. These pieces must be cut so the inside dimensions of the completed box accept the tissue box. (I built this box around a small box of *Kleenex* brand tissues. If you choose another brand, check the box size before making the cuts.)

I chose ½" hard maple for the four sides of the box. (Hard maple makes cutting the dovetails a bit more of a challenge.)

The dovetails are laid out as shown in Fig. 1. When marking the base lines for the pins and tails, the key thing is to make sure the distance between the base lines is large enough to accept the dimensions of the tissue box.

THE BASE. Once the basic box is glued up, I cut four pieces of cherry 1¼" wide for the mitered base frame. (Note: the base must be a frame as shown. One piece of solid wood cannot be used because of expansion/contraction problems.)

To make the base frame, I cut an Ogee molding edge on the four pieces first. Then each piece is mitered and glued up to form the frame.

OPTION. This project could be a jewelry box by adding a plywood bottom. Rabbet the inside edge of each of the four pieces for the base (before they're glued up), and glue in a Baltic birch plywood bottom.

THE LID. After gluing the dovetailed box to the frame, I made the lid. The lid is a solid piece of cherry cut ½" smaller (in both dimensions) than the base. Once again I used an Ogee bit on the edge.

To mount the lid, I drilled two ¼" holes centered on the top edge of the short sides, and corresponding holes in the lid. Then ¼" dowels are cut to fit the holes.

If the box is to be used for jewelry, cut mortises on one of the long sides for small hinges. The only problem here is that we couldn't come up with a good way to mount a clasp on the lid.

FINISHING. The box was finished with three coats of 1 lb.-cut white shellac. (You can get 1 lb-cut shellac by thinning 3 lb.-cut 1:3 with denatured alcohol.)

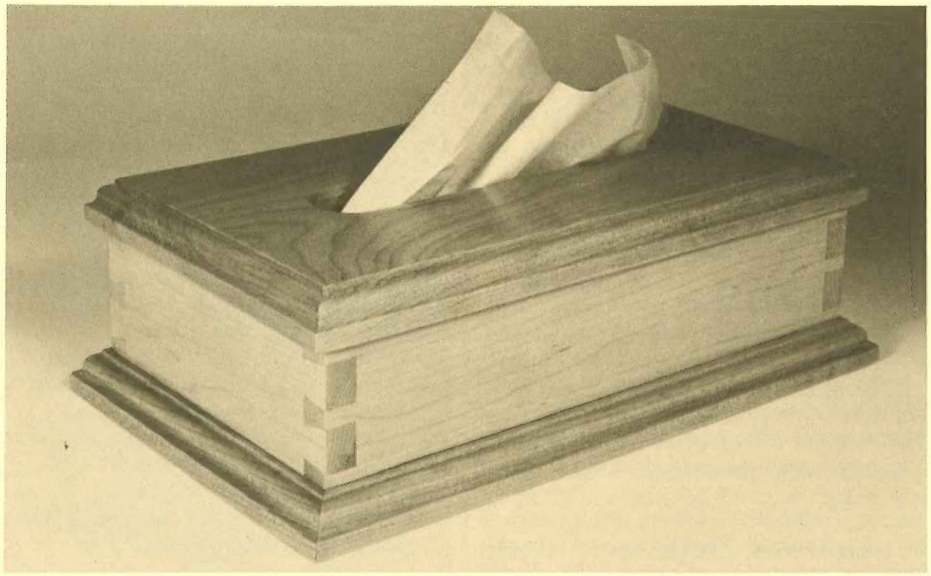


FIGURE 1

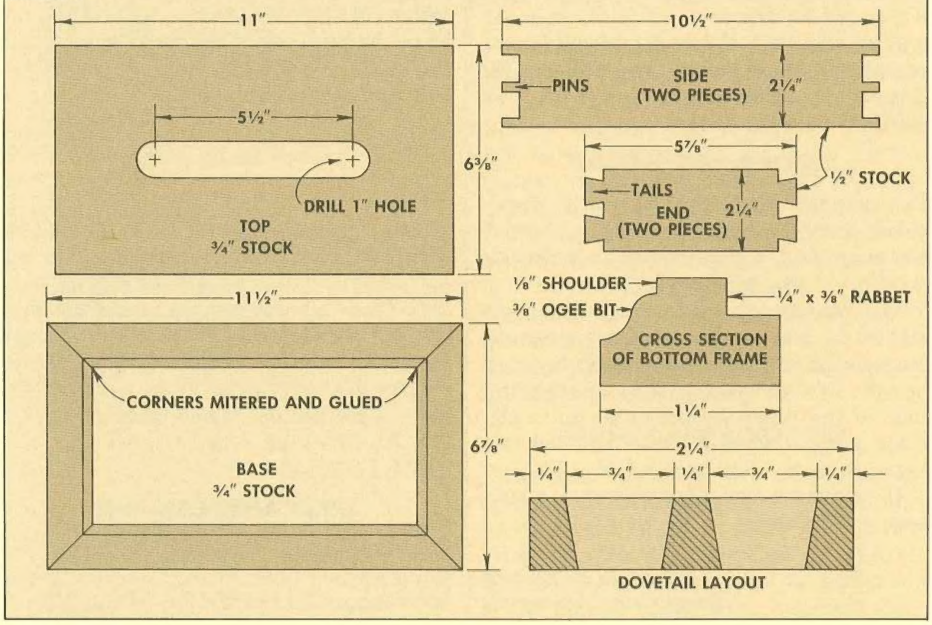


FIGURE 2